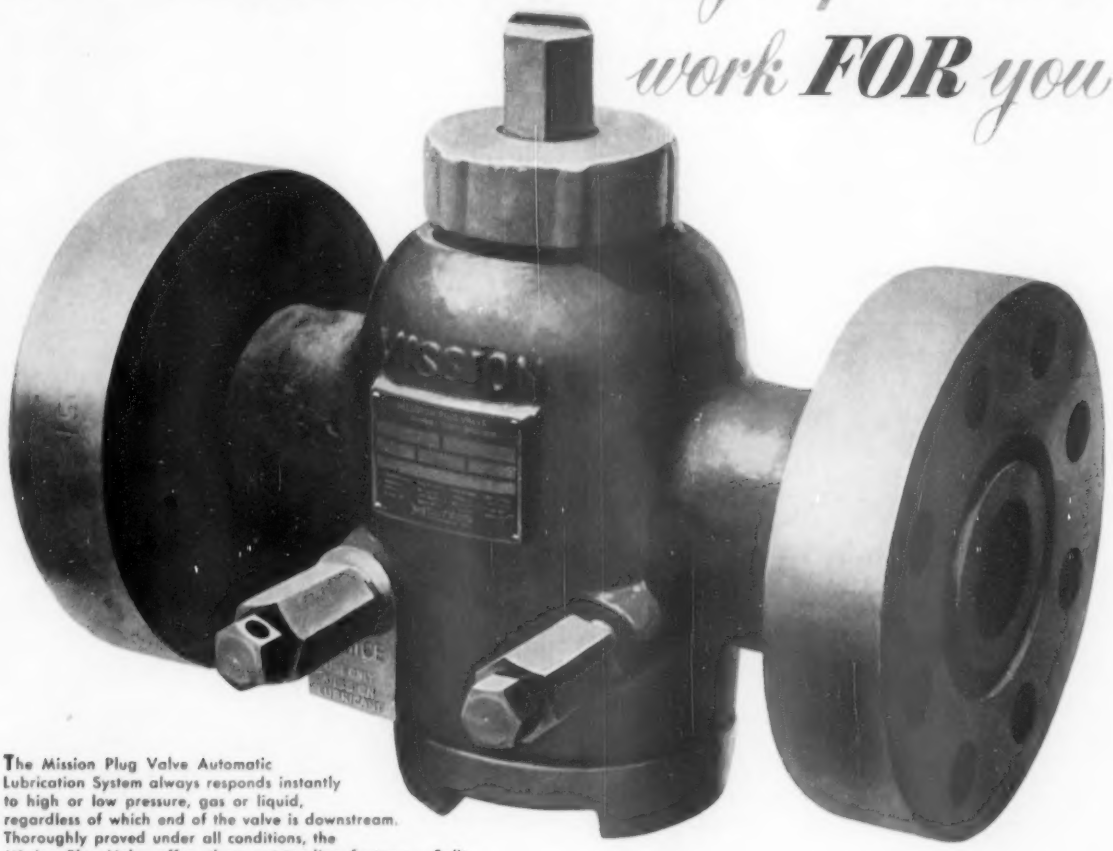
PRE-A.P.I. NUMBER

the OIL AND GAS JOURNAL

with ***THIS*** *valve ... high pressures work* ***FOR*** *you*



The Mission Plug Valve Automatic Lubrication System always responds instantly to high or low pressure, gas or liquid, regardless of which end of the valve is downstream. Thoroughly proved under all conditions, the Mission Plug Valve offers these outstanding features — Split core prevents wedging and assures perfect fit — Two lubricant reservoirs, operated by line pressure, automatically supply lubricant to sealing grooves — Full port lubricant grooves encircle both ports insuring perfect seal and complete lubrication — In the Mission Plug Valve no lubricant groove ever crosses a body port.

Like all other Mission Products, this plug valve carries the famous Mission Guarantee, and is available through all supply stores.

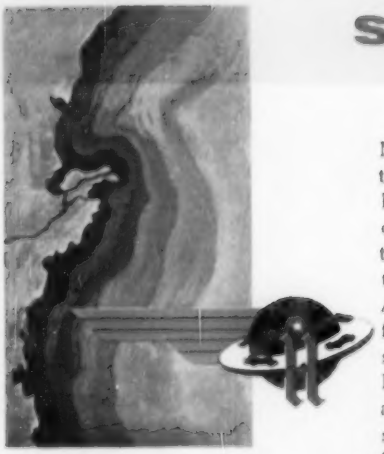
Nothing but the finest will ever bear the name of

MISSION MANUFACTURING CO.

P. O. BOX 4209 • HOUSTON, TEXAS

Export Office: 30 Rockefeller Plaza, New York

PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 **NOVEMBER 8, 1954**



Seagoing Service Camp

Neptune never saw more venturesome voyagers than those who seek the treasures of the tidelands. Among the oil men and the sea, Halliburton has earned its seniority afloat through long years of service in marine operations. Halliburton approached the sea by gradual stages, first meeting the new challenge in the shallow Mississippi Delta and the Louisiana Bayou in those early years when production was still only a promise—not a fact. As rigs began to move to deeper waters, tideland techniques and facilities for cementing, testing, logging and other production improvement services became a major Halliburton project in research and practice. Presently plowing over the warm green Gulf is the new Halliburton "207", a complete, modern seagoing service camp. It is the second of three such ships to be launched this year and brings to 16 the number of vessels flying the Halliburton flag. Short wave radio is an important part of the new ship's equipment. It will bring the "207" along side your drilling barge in a matter of minutes.

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

"THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING"

the OIL AND GAS JOURNAL NOVEMBER 8, 1954 VOL. 53 NO. 27

OIL IN THE NEWS . . .

Thirty-fourth Annual Meeting of A.P.I. Opens in Chicago 112
American Republics Corp. May Sell Out to Sinclair 117
Conoco Reported Negotiating for Kirby Petroleum Holdings 117
Pacific Northwest's Proposed Line Exerts Influence 118
Oklahoma's Beaver County Hits All-Time Drilling High 118
Rubberized Paving Materials May Give Refiners New Asphalt Market 119
Yellowstone Line Whips Problems of Elevation, Terrain 120
Committee Formed to Tell Gas Story to Consumers 121
Tejon Ranch Strike in California Assuming Great Importance 122
Gulf Coast Geologists Get View of the Future at Annual Meeting 124
World's Longest Submarine Pipeline One-Third Completed 125
Bethlehem Steel Co. Unveils Largest Drilling Platform Yet Built 125
California Co. Will Drill 16 More Wells in Bay Marchand 125
Houston Pipe Mill Shut Down Because of American Louisiana Delay 125
Gas from North Dakota Plant May Be Key to Pipeline Fight 126
Buttram Petroleum Wins Approval for L.P.G. Flood in Camp Hill Field 129
Cities Service Asks Permission to Water Flood Welch Field 129
Twenty-six Refinery Projects Canceled After Tax Grants Made 130
Senator Kefauver Threatens Probe of FPC 130
Kerr-McGee Waits for Decision on Bid Deposit 130
Better Unemployment Compensation Suggested as Union Curb 131
Three Latin American Nations May Lower Barriers to U. S. Capital 132
Iran Exports First Oil Under Recently Announced Settlement 133
Argentina Contracts for 2,500 Bbl. Daily of Bolivia Crude 133
Free World Crude Production Drops Third Consecutive Month 134
Venezuelan Company Invites Bids for Crude Line From Lake Field 135

SPECIAL PRE-A.P.I. SECTION . . .

[1]What's the Score on Electronic Process Control?—D. M. Boyd; Roger Gilliland 136
Monolithic Design Cuts Packaged T.C.C. Plant Cost—D. H. Stormont 142
Field Coordinating Group Improves Refinery Maintenance—E. C. Hermann 144
Digest of S.E.G. Papers 147
[2]Lick Those Crooked-Hole Problems—R. J. Bromell 149
[3]Operation of Duplex Slush Pumps in Parallel—R. L. Walker and R. A. Tappmeyer 154
The Third Dimension in Engineering—Stanley R. Harris 163
[4]Advantages of In-Tank Mixing of Crude Oil—Neil J. Wilson 165
Great Lakes Pipe Line Tests Coatings—Paul Reed 169
Crude-Oil Absorption Clicks with Union—J. A. Gordon 172
Combating External Well-Casing Corrosion by Cathodic Protection—Yale W. Titterington 178
Better Separator Sampling of Crude-Oil Reservoirs—F. O. Reudelhuber 181

TECHNOLOGY AND OPERATION . . .

Engineering Reference Section 185-192
Pipeline Patrol: Service Pipe Line's Mobile Laboratory 203

EXPLORATION . . .

North Park . . . Front Row Center Again 243
Puckett Field Opens New Vistas in West Texas 244

DEPARTMENTS . . .

They Say 95
Calendar of Events 103
Journally Speaking 107
Editorial 109
This Week 111
Watching Washington 131
International News 132
Books 141
Refining News 199
Equipment Digest 211
Trade Literature 219
Equipment Men in News 226-290
Statistical Summary 281
Drilling Statistics 282
Supply Statistics 283
Refining Statistics 284
Demand Statistics 285
Monthly Statistics 286
Classified Advertising 287
Advertisers' Index 291

FIELDS . . .

Drilling Contractors 195
Area Field Reports 248

In Brief . . .

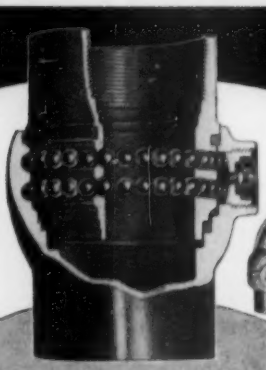
1. BETTER CONTROL? . . . Rock Island Refining Corp. has recently put on stream the first refinery unit in the United States to be completely instrumented and controlled by electronic means. Operating results thus far seem to indicate that for some installations electronic instrumentation will give superior control results. It is estimated that electronic instrumentation of a unit costs somewhat less than a pneumatic outlay.

2. CROOKED-HOLE SOLUTIONS . . . Thorough preliminary planning is needed to lick crooked-hole problems. Often the contractor can find out before hand where the hole will go off, how severe it will probably be, when the hole will straighten, and what size hole must be drilled. Proper selection of drill collars, stabilizers, and reamers will greatly reduce the cost per foot. Use of Lubinski and Woods charts can in most cases result in lower drilling costs.

3. EFFICIENT PUMPING . . . Economies attributable to reduced down time, higher horsepower application, and lower maintenance and repair costs dictate application of medium-sized pumps in parallel to depths in keeping with their pressure capacity with smallest practical sized line. For deep drilling, most attractive parallel application is offered by medium-volume-capacity pumps designed for high-pressure applications.

4. ECONOMICAL MIXING . . . Use of in-tank mixing appears to be an economical solution to two problems of long standing in pipeline and refinery operations—accumulation of sediment in crude-oil-storage tanks and gravity variations in crude streams to refinery units. Tests by Shell Pipe Line Corp. have established the economies of installing mixers and in operating procedure for best results.

BRONZE STEEL



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FULL UNRESTRICTED FLOW • EFFORTLESS MOVEMENT
GREATER LOAD CARRYING CAPACITY • "O" RING SEALED
CONTAMINATION FREE OPERATION • PERFECT ALIGNMENT

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The wide range of sizes and styles of OPW BALL BEARING SWING JOINTS offers many and varied applications for safely handling liquids of diversified viscosity at required temperatures and working pressures.

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Millions of gallons of all types of liquids are moved daily in flow lines where perfectly sealed, rotating OPW Swing Joints provide an almost limitless range of flexible operations.

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No. 40

Join other users of OPW Swing Joints. You can also realize economies in your liquid products handling.

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Free Catalog F-8

provides engineering data, sizes, styles, recommendations and prices.

No. 50FX5

No. 40X5

No. 50F

No. 50

No. 50X1

No. 40FX5

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FOR HANDLING HAZARDOUS LIQUIDS
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VALVES • FITTINGS • ASSEMBLIES
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How to *INCREASE BOILER RATINGS*

with your present furnace and stack

Coppus-Dennis FANMIX Burners Give You More Heat with No Other Major Change in Equipment

Coppus-Dennis **FANMIX** Burners give you *perfect* mechanical mixing of fuel and air *at the burner outlet . . . instantaneous* ignition close to the burner . . . and *complete* combustion *without visible flame* when burning natural gas. No other burner combines these three advantages.

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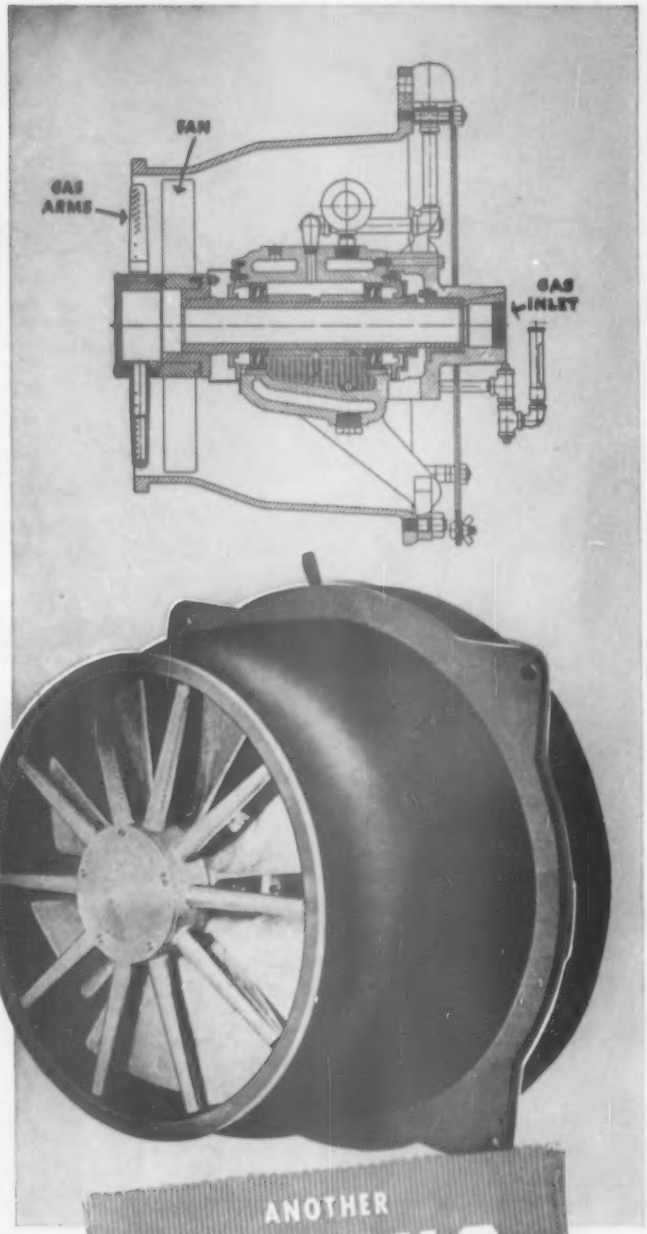

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A message to the Oil Producer who contracts the drilling of his wells:

The type of drilling equipment your Contractor proposes to use is of major importance to You!

If it's to be a DEEP well . . . and your contractor tells you that he will put an "Oilwell" No. 96 Rig on the job with "Oilwell" No. 220-P Pumps and companion "Oilwell" heavy-duty equipment, you can be sure that you are being offered the services of a rig that can go to 16,000 feet with 4½" drill pipe—and deeper with 3½".

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The New AMERICAN T3

Features of the T3D-D10

- Designed for shallow wells.
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- Bronze bushed Saddle and Equalizer Assemblies.
- Four-legged, derrick-type Samson Post.
- Sealed bearing assemblies.
- Long Lasting Herringbone Geared Reducer.

Now . . . the American T3D-D10 completes the greatest line of pumping units made. It's the perfect answer to economical pumping of shallow, small capacity wells. Precision made, like all its big American brothers, the T3 will give you years of service for a minimum of maintenance. And, when you check its price against its quality, you'll find the American T3, the BEST BUY in the oil fields.

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Both engine and generator are mounted on a sturdy frame. Two-wheel mounting also available.

New P&H WN-250 Pipeliner

–an engine-driven arc welder developed by pipeliners to meet pipeline-welding requirements

Here you get everything you've ever wanted in a pipeline welder — including features you don't get from any other. Take a look:

(1) The P&H WN-250 is NEMA-rated at 200 amps—*but pulls 300 amps!*

(2) It has a full 20-gallon gas tank — runs all day on one tankful!

(3) It is powered by a four-cylinder, 180 GLU, Waukesha gasoline engine —direct-connected, water-cooled, and built for heavy duty. And we really mean *heavy* duty — it's not an automotive light-weight.

(4) P&H idling device establishes the rated speed of 1800 rpm as soon as the arc is struck. This speed is maintained for a set period after the arc is broken.

(5) P&H Dial-lectric Control provides stepless heat adjustment over the entire 3 ranges — with just a turn of a radio-type knob.

(6) Pre-lubricated bearings reduce the need for servicing and insure longer life.

(7) Auxiliary AC power-supply (1 KVA) permits flood-lighting and running power-tools.

There are other reasons why you're money ahead with a P&H WN-250. Ask your P&H representative or distributor for all the facts. Or, write for bulletin.

P&H WELDING DIVISION
HARNISCHFEGER CORPORATION
4527 W. National Ave., Milwaukee 46, Wis.

Continuous 8-hour welding test demonstrates the extra stamina of the P&H WN-250

You can't beat welding performance like this: In a recent test, the P&H WN-250 operated continuously for 8 hours on a 70% duty cycle.

A 5/32" electrode was used with 300 feet of cable. There were 250 amps. at the electrode. So that the test would be continuous, three welding operators were used. When one got tired, another took over. All used the drag technique with a 6010 rod — which is as close to a short circuit as you can get.

At the end of 8 hours, the P&H generator was still cool. And the WN-250 was still rarin' to go—the weldors were worn out, but not the machine.

the P&H *Line*

2898A

P&H Welding equipment is manufactured and sold in Canada by
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Me – I could write a buyer's guide!

When it comes to equipment, you can't fool maintenance men. They know what stands the gaff—and what doesn't. They also know a lot of their work is due to faulty selection of equipment —mistakes in judgment of quality, mainly.

In buying valves, such mistakes usually happen when someone buys on price alone, or because "all valves look alike." In either case, today's penalty is excessive maintenance at the highest labor rates in history. And where valve trouble causes production loss, it, too, was never costlier.

Standardizing on Crane valves eliminates a lot of mistakes, and it's the thriftiest habit in piping equipment buying. Better Crane quality and bigger selection assure it.

Crane Co., *General Offices: 836 S. Michigan Ave., Chicago 5, Ill. Branches and Wholesalers Serving All Industrial Areas.*

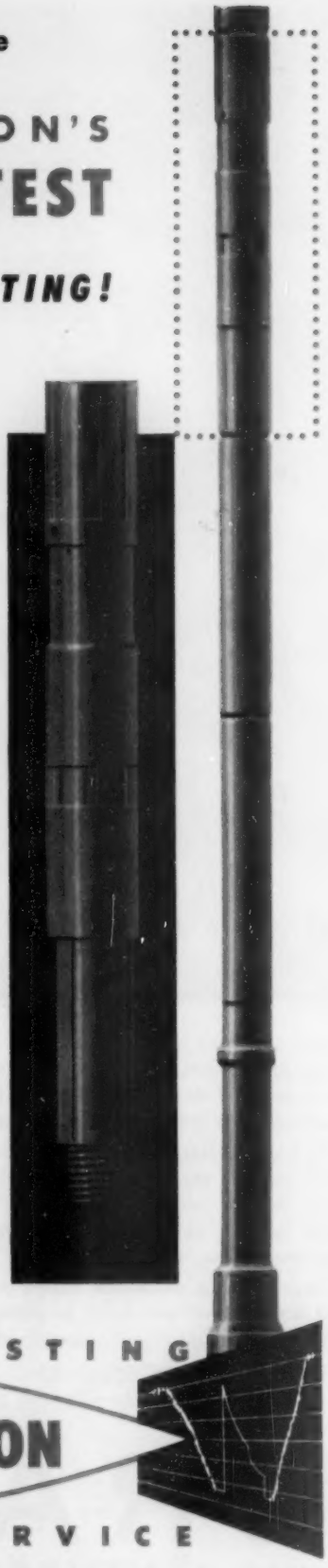
CRANE

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

perfect runs with perfected tools make

HALLIBURTON'S HYDRO-SPRING TEST

FIRST and BEST in DRILL STEM TESTING!



The most successful test on your well starts with your call for Halliburton's Hydro-Spring Test – the formation test that sets year-to-year records for perfect runs, fast and complete service and perfected tools. These are the performance features that make Halliburton first choice with most operators everywhere .. check these important firsts and you'll know why Halliburton holds the important top spot with the most accurate, modern and complete service:

- **FIRST** with hydraulic testing – Halliburton's Hydro-Spring Tester.
- **FIRST** with most accurate pressure recording – Halliburton's Bourdon Tube Device.
- **FIRST** with new instant release packer – Halliburton's Expanding Shoe Packer.
- **FIRST** in number of perfect runs – Halliburton's Hydro-Spring sets records for successful tests.
- **FIRST** in minutes-away availability – Halliburton's 211 camps in this country alone.
- **FIRST** in testing research and development – Halliburton's 30-year record of intensive research.
- **FIRST** in experience – Halliburton's experience on more than 2 million jobs.
- **FIRST** in testing – Halliburton's first choice with majority of operators.

Like most operators, make Hydro-Spring your first thought for formation testing – because being first and best is a Halliburton tradition that started more than thirty years ago. Get all the facts on Halliburton's success and you'll know why the swing is to Hydro-Spring – the *best* for *your* drill stem test. Call your local or district Halliburton office. Or contact Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

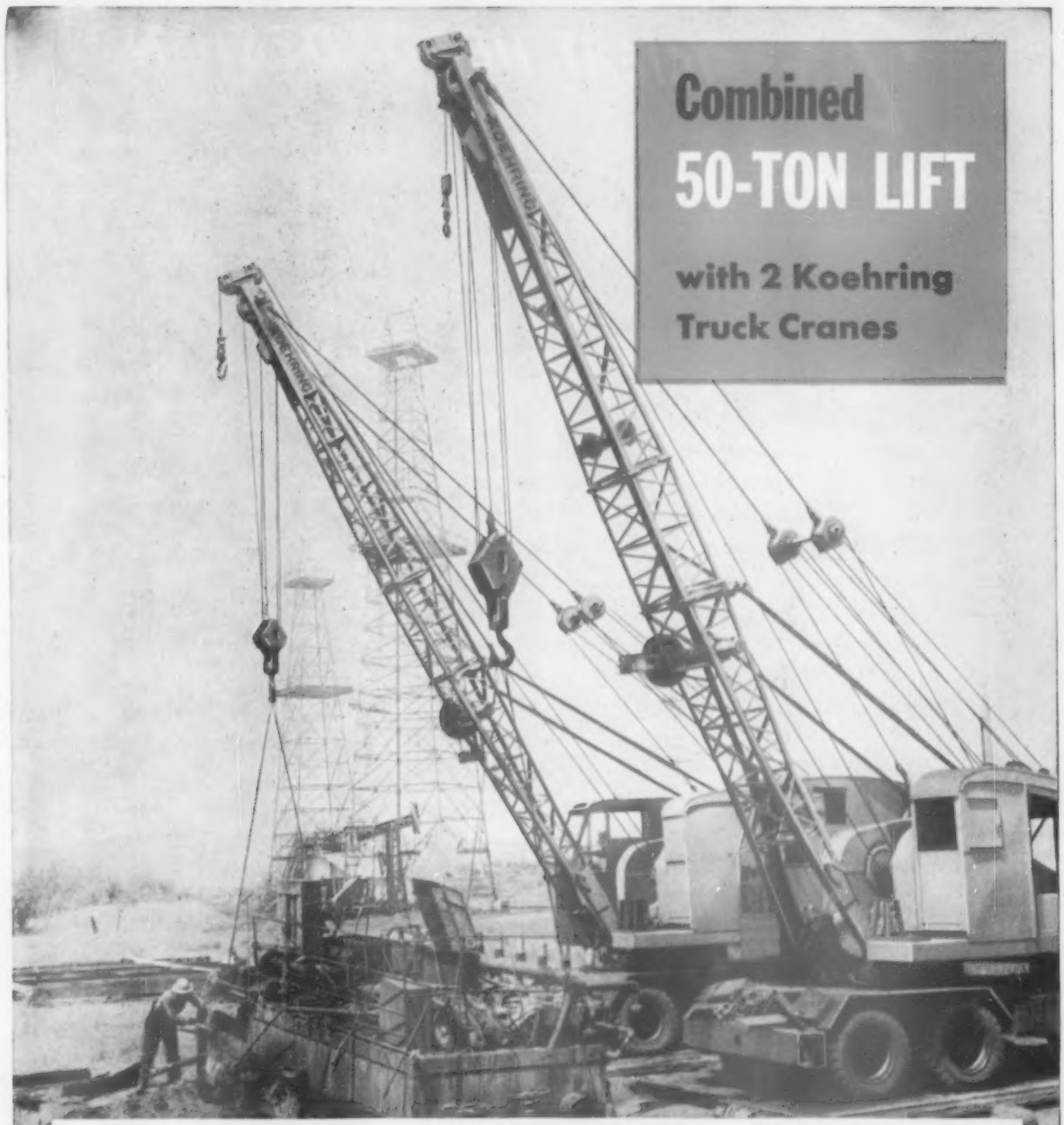
Hydro-Spring Tester – Patent Applied For

TESTING

HALLIBURTON

SERVICE

"HALLIBURTON'S BEST FOR YOUR DRILL STEM TEST"



Combined 50-TON LIFT

with 2 Koehring Truck Cranes

Lifting a heavy mud tank assembly into place, two Koehring 304 Truck Cranes (above) worked as a team . . . exerted a total lift capacity of 50 tons. As the cranes inched the bulky load into position, power-boom lowering provided safe, positive control. Mechanical booster clutch on each crane retained exceptionally accurate "feel" of load during lifting and lowering. On heavy work like this, Koehring 304 booster clutch provides another important advantage. It reduces operating effort . . . requires only one-third to half the lever pull of a straight manual clutch.

This heavy-duty 25-ton crane also converts to dragline, clamshell, pile driver, ¾-yard shovel or hoe . . . is available on rubber-tired truck, cruiser mounting, or heavy-duty crawlers to suit all working conditions in the oil field. Get complete details from your Koehring distributor, or write for your copy of new 36-page 304 catalog.

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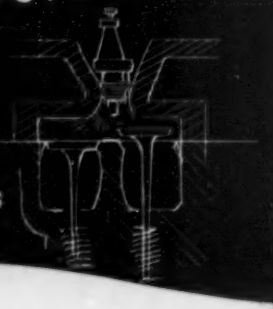
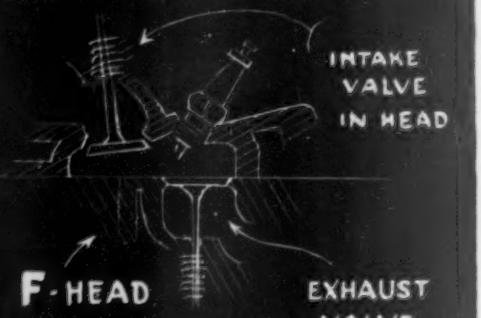
CRANES up to 79½ TONS lift capacities . . . EXCAVATORS ½ to 2½ yards

2 EFFICIENT HEAD DESIGNS





"JOHN" WILLYS *

Engine Chalk Talk

I don't know of another engine manufacturer who can offer the versatility that these two Willys head designs make available. Basically, the "L" head has plenty of power and excellent torque at medium speeds. It is a **rugged** Willys design with plenty of power uses. The "F" head develops even **more** power . . . and smoothly . . . right up to maximum rpm. Its torque curve is almost constant at all speeds. We know this engine will find many applications in equipment where extra lugging power is desirable.

* Design Department, Willys Motors, Inc.

Willys POWER GIANT

Industrial Engines and Power Units

Willys POWER GIANTS have been designed especially for industrial uses. They are based on the world famed Willys engine designs with "proven-in-action" performance and features.

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Hurricane	4 F	134.2	22 - 70	1200 - 4000
Lightning	6 L	161.0	28 - 75	1200 - 4000
Giant Hurricane	6 F	161.0	28 - 90	1200 - 4200

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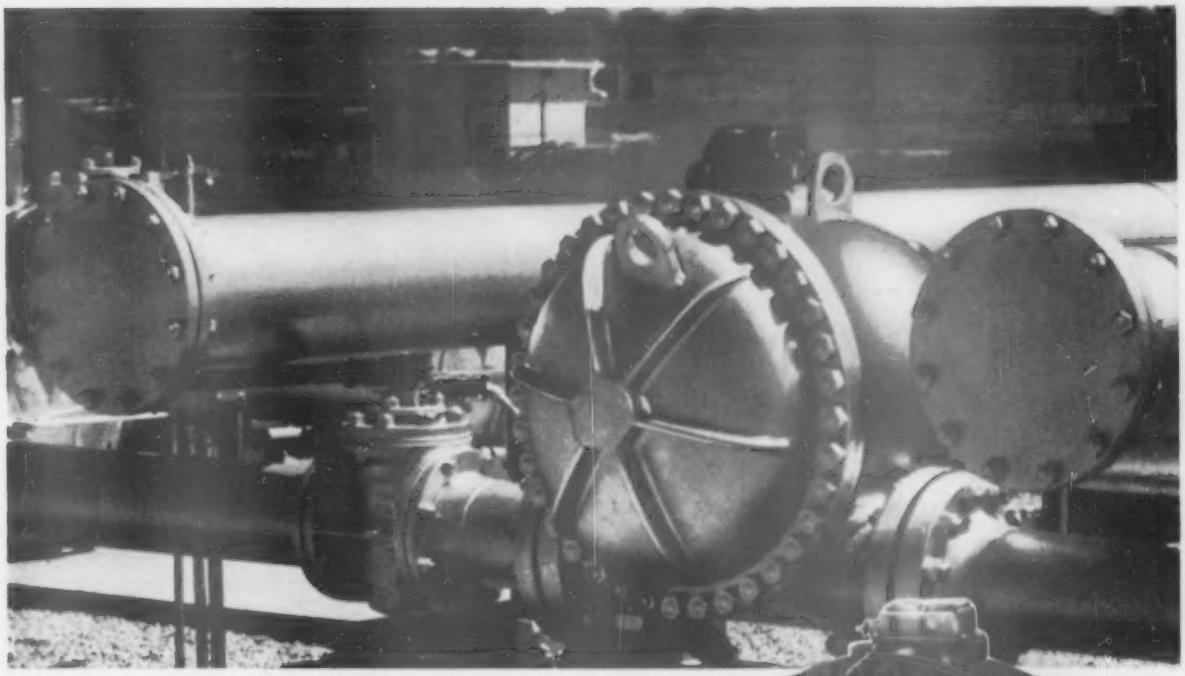
WILLYS MOTORS, INC. *Industrial Engine Department*

THE METER THAT *Takes Care of Itself*

with rugged dependability and low maintenance in pipeline service



Model B-105 Brodie BiRotor Meter built for 1000 psi metering incoming crudes to tank storage.

- Unaffected by fluid surges and shocks
- No vibration to cause wear or fatigue
- High capacity with ample safety margin
- Complete static and dynamic balance
- True rotary motion — no reciprocating parts
- No metal-to-metal contact in measuring chamber
- Double case construction
- Completely self-lubricated

For product or crude lines, gathering stations, tank farms, division point control, Brodie BiRotor Meters are noted for high sustained accuracy and low maintenance. Fully balanced design, with two moving parts in the metering chamber, provides smooth continuous delivery at practical operating capacities and pressures. Double case construction protects the measuring element from piping strains. For top performance and efficiency in metering crude or finished products, with direct reading or remote controlled counters, investigate Brodie BiRotor Meters. Get full details from your Brodie representative today.

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- **FIRST—Offshore Drilling Structure—1937**
- **LARGEST—Offshore Drilling Structure—1947**

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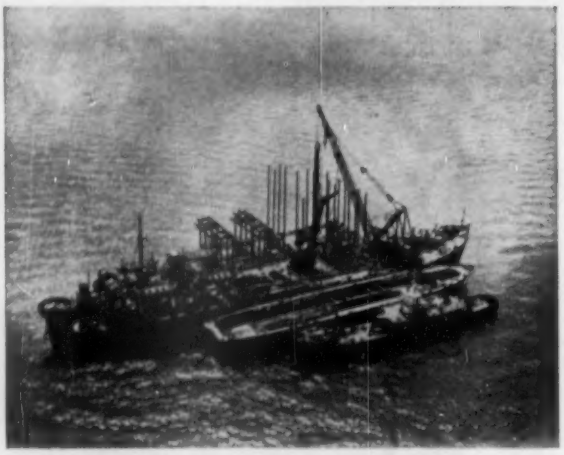
The use of sea going equipment accounted for the loss of only 17 work days due to weather during one whole year.



• PERFORMANCE—

No storm damage to any structures designed and built in the company's offshore history of over 30 platforms.

• LEADERSHIP—*Now ready with designs for 200′ water depths.*

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OFFSHORE STRUCTURES, WHARVES, BULKHEADS, FOUNDATIONS

Here's another reason why

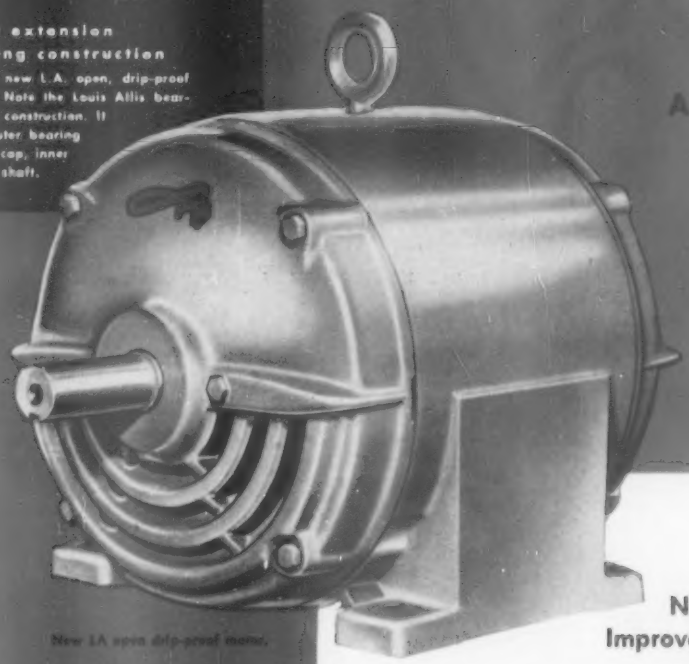
the NEW L.A. *Line*

by the Louis Allis Co.

is your BEST *electric motor* BUY

Shaft extension bearing construction

used in new L.A. open, drip-proof motors. Note the Louis Allis bearing-cap construction. It locks outer bearing race to cap, inner race to shaft.



New LA open drip-proof motor.

A brand-new power package, completely redesigned inside and out

with NEW BEARING CONSTRUCTION

plus

New modern styling
More compact design
New conduit box arrangement
Improved ventilation and better protection
More versatile mounting

HERE'S the locked bearing construction that makes the new L.A. motors even better—gives them extra life, extra dependability. It positions the rotor . . . limits shaft end-play . . . gives you ample V-belt drive capacity. You get factory prelubrication, too, with a new, improved grease-retaining system that saves servicing and maintenance — for years of attention-free operation under most conditions.

That's not all! You get standard bearings in every unit — sizes specially selected to be easily obtainable from local stocks. And there's no need to tear the motor down to get bearing numbers — they're stamped right on the new motor nameplate.

Add this modern, dependable bearing construction to all the other features and you see why the L.A. line is your best motor buy. Get the complete story from your nearby Louis Allis Sales Engineer.

We specialize in
SPECIAL MOTORS *and*
PROMPT DELIVERY, TOO

There's a Louis Allis special motor for your toughest application. Whatever electrical or mechanical modifications you need, check first with Louis-Allis.

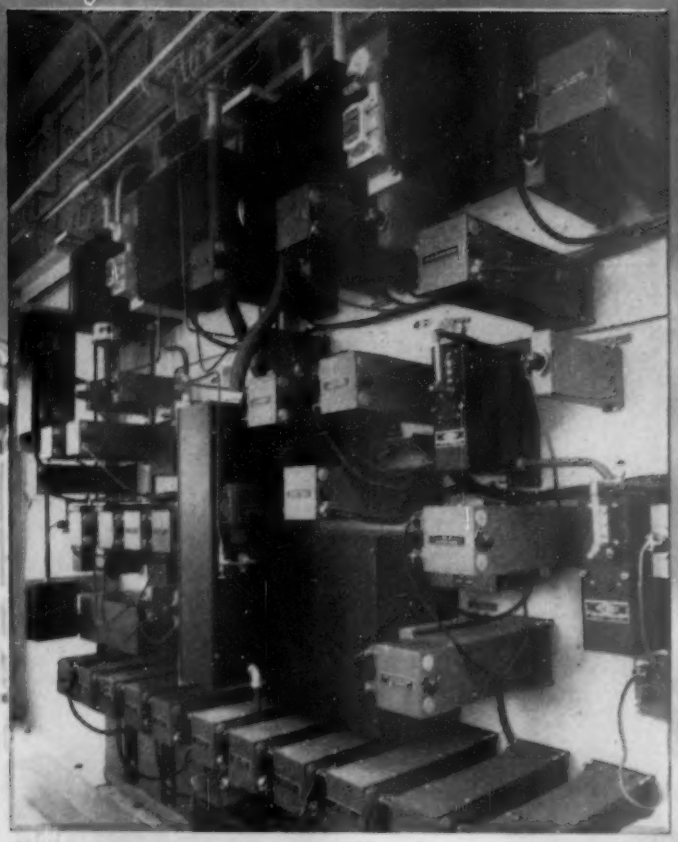
Vertical NEMA C-flange motor

NEMA D-flange motor

NEMA C-flange motor

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

LA-105



This view shows the back of the graphic control panel and of the electronic instruments for the UOP Platforming unit at the refinery of Rock Island Refining Corporation at Indianapolis, Ind. This Platformer is the first complete refinery unit in the United States to be controlled by electronic equipment.

Rock Island Refining Corp. Has First Complete Refinery Unit Controlled By Electronics

By L. E. Winkler
President
Rock Island Refining Corp., Indianapolis, Ind.

PROGRESSIVE thinking and action are vital to our refining operations. Since Rock Island Refining Corporation was organized in 1940, we have constantly sought to maintain our position as one of the most modern refineries in the world, dedicated to staying in the forefront of the petroleum refining industry as it produces higher quality products.

L. E. Winkler

Rock Island was the first refinery in the world to install a graphic control panel, a device which since has revolutionized the control of refinery processes. It was also one of the first refineries anywhere to build a UOP "stacked" Fluid Catalytic Cracking unit.

Now Rock Island has scored another "first"—a complete refinery unit which is instrumented by electronics.

The new type of instruments are controlling our 2,400 barrel-per-stream day UOP Platforming unit, which went on stream recently to produce motor fuel blending component. Although the Platformer has been running only a short time, the electronics equipment already has paid dividends through a smoother startup and easier handling.

Our decision to install electronic controls was based on economic factors as well as our desire to keep ahead of the industry in modern refining techniques. We took a long-range look at the potentials of this new type of equipment and ascertained that:

(1) It would increase the reliability of the Platformer's operation in cold weather by eliminating the possibility of freezing up of instrument transmission lines.

(2) It would do away with racks for the pneumatic tubing from the graphic panel to the battery area, thus reducing initial installation costs and problems connected with startup and maintenance operations.

(3) It would result in better control because of the increased sensitivity of electrical impulses.

Controls Work Perfectly

The electronic controls worked perfectly from the very beginning. On the day selected for the startup of the Platformer, oil was put into the unit at 9:30 a.m., and in less than three hours the unit was completely "lined out"—operating smoothly at the desired conditions. In less than two weeks, the unit had fully proved itself and had come to be considered a part of our routine refinery operations. Universal Oil Products Company designed, engineered and licensed the Platformer. UOP's instrument department engineered the installation of the electronic controls.

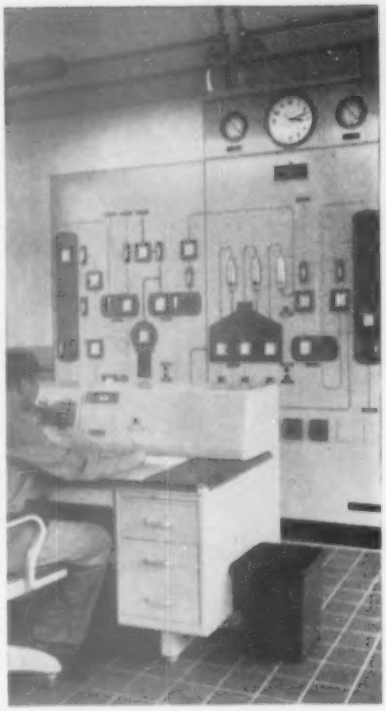
In our instrumentation, transmitters located in the battery area of the Platformer measure temperatures, pressures and flow and convert them to electrical signals. These go to recorders located on the graphic panel and to controllers, also located on the panel.

The controller compares the signals with a signal from the set point mechanism on the recorder that has been set previously by an operator. The controller sends out a current signal to the control valve, causing it to assume a given position. In the event the transmitter signal does not match the set point signal exactly, the controller modifies the current signal to the valve, located in the battery area. At the valve, the current signal is converted to a pneumatic pressure corresponding to the current signal in order to supply the power necessary to position the valve. This causes the valve to either open slightly or close slightly in order to bring the transmitter signal back into line with the set point signal.

Electronic Controls Act Swiftly

We have found that the electronic controls give almost instantaneous response when there are variations in temperature, pressure or flow through the Platforming unit. In addition, there are few moving parts in the equipment, thus reducing maintenance and wear. There is also complete interchangeability of parts, making it as easy to change parts as it is to change a light bulb.

We at Rock Island are proud to be the first refinery in the United States to install complete electronic controls to operate a major processing unit, and we believe sincerely that this instrumentation will go far toward helping us to consistently make better petroleum products from the crude oil that we process.

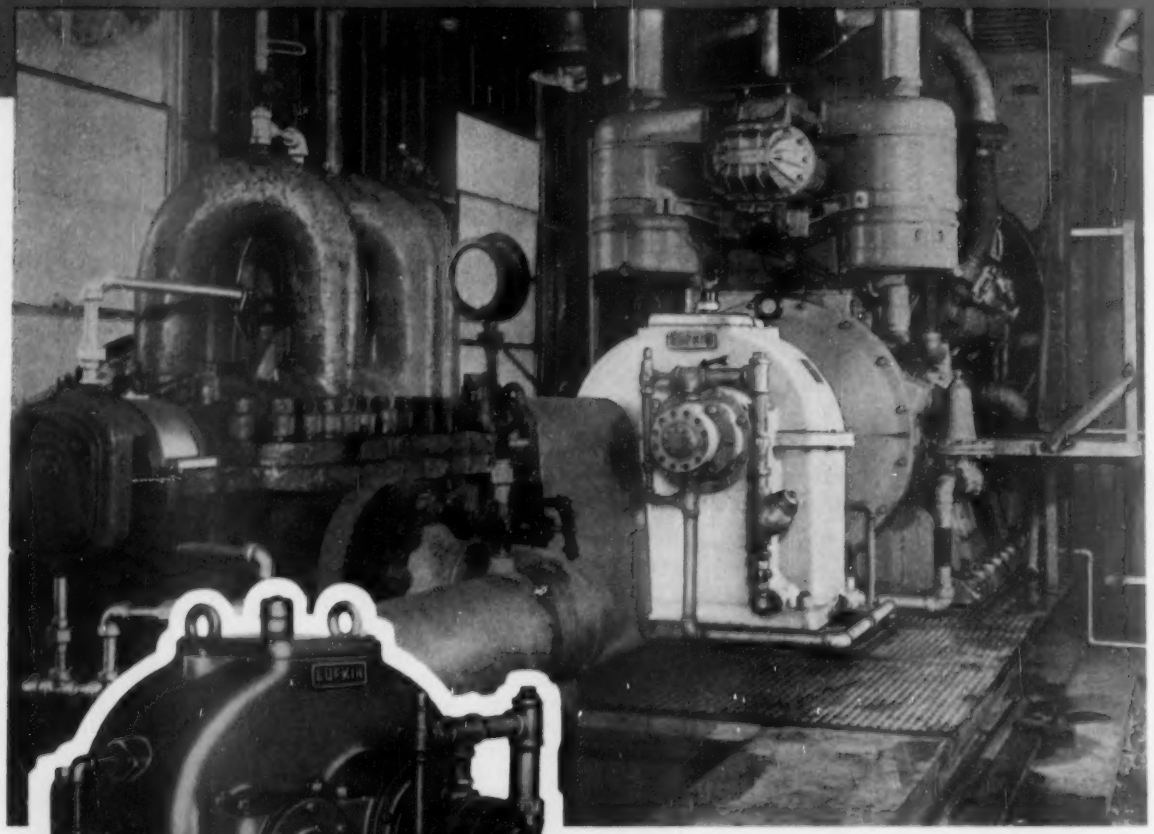


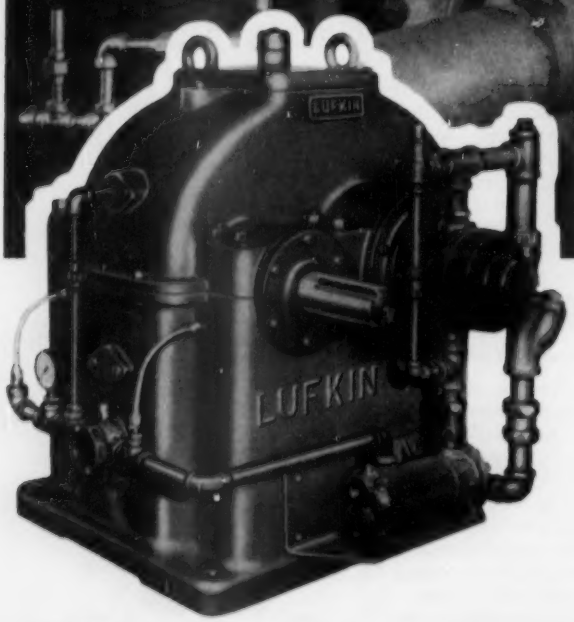
INDIANA
REFINERY
MAINTAINS
LEADERSHIP
WITH
NEW
UOP PLATFORMER

designed, engineered and licensed by
UNIVERSAL
OIL PRODUCTS
COMPANY
30 ALGONQUIN ROAD,
DES PLAINES, ILL., U. S. A.
Laboratories: RIVERSIDE, ILLINOIS
Universal Service
Protects Your Investment

LUFKIN Precision Gears

GUARANTEE THE UNINTERRUPTED TRANSMISSION OF POWER SO NECESSARY FOR THE UNINTERRUPTED TRANSMISSION OF OIL





HERRINGBONE GEARS GENERATED WITH EXTREME ACCURACY—RIGIDLY MOUNTED IN HEAVILY REINFORCED HOUSING—TO GIVE MANY YEARS OF QUIET, VIBRATIONLESS, TROUBLE-FREE OPERATION.

LUFKIN OFFERS A COMPLETE LINE OF SPEED INCREASERS FOR ALL TYPES OF PIPELINE SERVICE.

Lufkin FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

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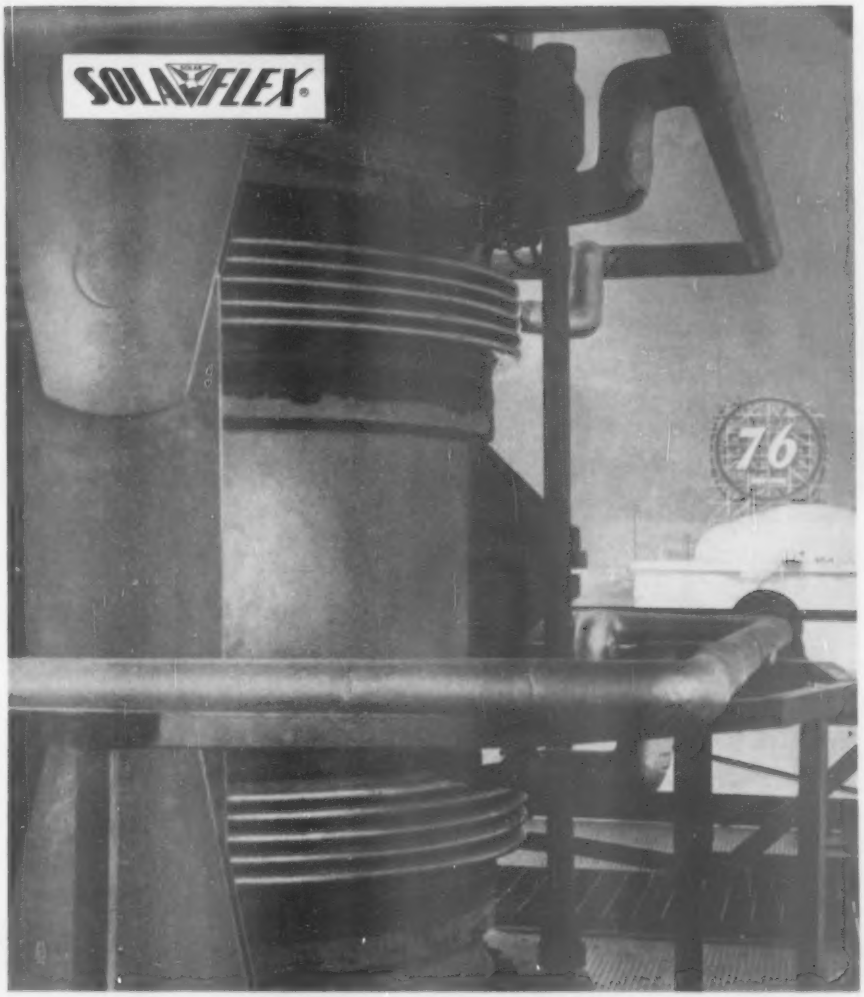
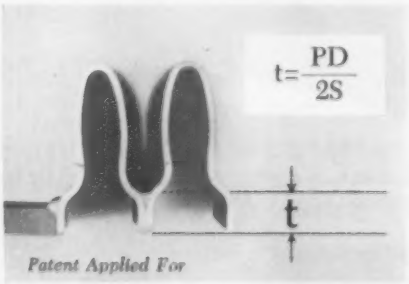
Brookhaven, Mississippi • El Dorado, Arkansas

Lufkin equipment in Canada is handled by THE LUFKIN MACHINE CO., LTD., 14321 108th Avenue, EDMONTON, ALBERTA, CANADA



Sola-Flex U-span Bellows absorb 4 inches of offset movement

THE SOLA-FLEX U-SPAN bellows shown above are installed at the Union Oil Company of California's Wilmington Refinery. They are in a 48-inch flue gas line between the steam generator and the regenerator. The joint absorbs 4 inches of offset movement and operates in temperatures from ambient to 1100 F, with a normal internal pressure of 35 psi.



Patent Applied For

The unique construction of Sola-Flex U-span bellows provides stress rings as an integral part of the unit. This design (illustrated below) eliminates the need for separate external supports.

Use of Sola-Flex expansion joints has grown rapidly in recent years. They are now in use by all major oil companies, and conform fully with API-ASME Piping Codes.

Sola-Flex catalogues offer complete range of sizes in standard expansion joints and convoluted couplings. Experienced Solar engineering teams are available to develop custom designs for special applications.

SOLAR AIRCRAFT COMPANY — SAN DIEGO, DES MOINES

DESIGNERS, DEVELOPERS AND MANUFACTURERS OF METAL ALLOY PRODUCTS

This is What Solar Offers You

Solar specializes in the manufacture of precision products from alloys and special metals for severe service. Solar's experience since 1927 is unduplicated in this field. Solar skills and facilities range from research, design and development through to mass production. Wherever heat, corrosion or difficult specifications are problems, Solar can help you solve them.

PLANTS. *In San Diego and Des Moines (photograph above). A total of 1,400,000 sq ft of floor space. Approximately 5,000 employees. Annual sales over $65,000,000.*

EQUIPMENT. *Production equipment for all types of metal fabrication —forming, machining, welding, brazing, casting, coating. Extensive laboratory and testing equipment. Facilities for development, prototype, limited or mass production.*

SERVICES. *Research, design, development, tooling and production engineering staffs. Experienced with all alloy steels, stainless alloys, super alloys, and titanium and its alloys. Government source inspection and Solar quality control meet rigid aircraft and commercial standards.*

CONTRACT PRODUCTION

Current orders include aircraft engine and airframe parts, alloy castings, pneumatic ducting, atomic energy components. Customers include some of the most honored names among aircraft and industrial companies in the U.S. and Europe.

SPECIAL PRODUCTS

Bellows. *"Sola-Flex"® bellows and expansion joints in many designs from ½ in. up to the world's largest, 28 ft in diameter.*

Gas Turbines. *Solar "Mars" 50 hp engines for auxiliary generator sets, ground carts, portable fire pumps; Solar "Jupiter" 500 hp engines in variable and constant speed models.*

Ceramic Coatings. *"Solaramic"® is the Solar trade mark for a family of coatings that protects metals from heat, corrosion, galling and abrasion.*

Controls. *Complete control systems utilizing the new Solar "Microjet"® principle for control of gas turbines, jet engines and pneumatic devices.*

FURTHER INFORMATION
Your inquiry regarding any Solar service or facility will receive prompt attention. Address Solar Aircraft Company, Department A-40, San Diego 12, California.

HAMMOND ANNOUNCES ITS TUBESEAL* SYSTEM FOR FLOATING ROOF TANKS

new or old—riveted or welded

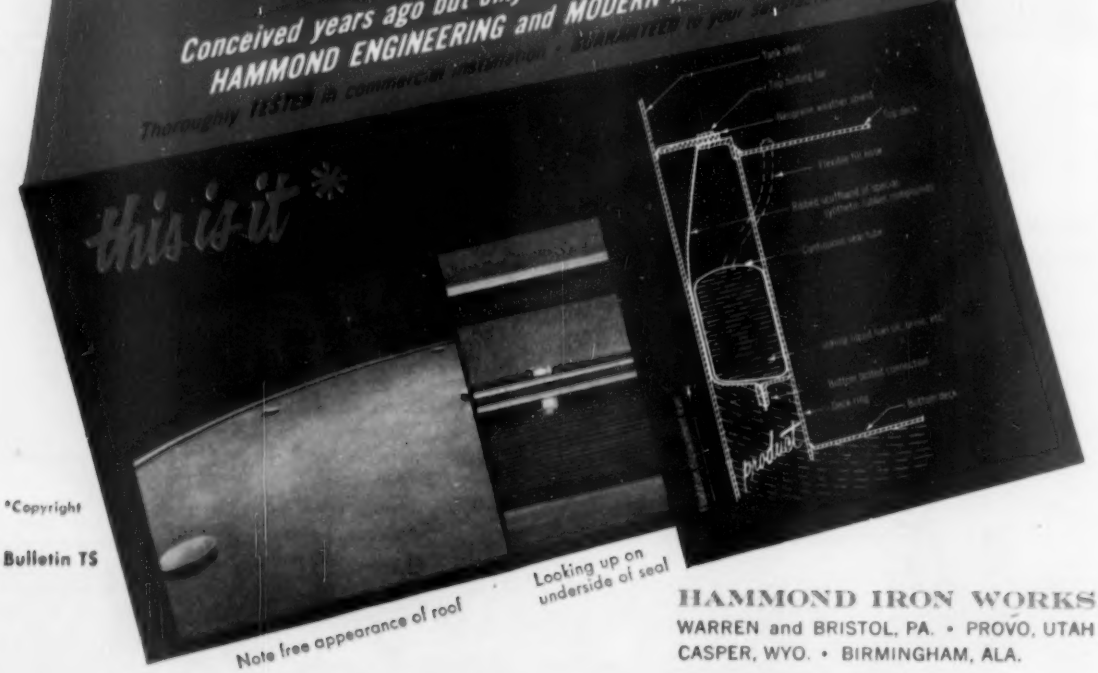
THE MOST EFFICIENT AND POSITIVE SEAL KNOWN

1 no moving parts
2 no mechanical maintenance
3 overcomes tank out-of-roundness
4 climate proof
5 non corrodible
6 can operate to bottom of tank or above the top
7 no vapor space below the seal
8 entire circumference has tight seal under pressure at all times

Conceived years ago but only made possible by combining HAMMOND ENGINEERING and MODERN MATERIALS

Thoroughly tested in commercial installation · GUARANTEED to your satisfaction

*this is it**



Note free appearance of roof

Looking up on underside of seal

*Copyright

ask for Bulletin TS

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Packaged Compressor Plant

Lowest Cost Per Horsepower Installed

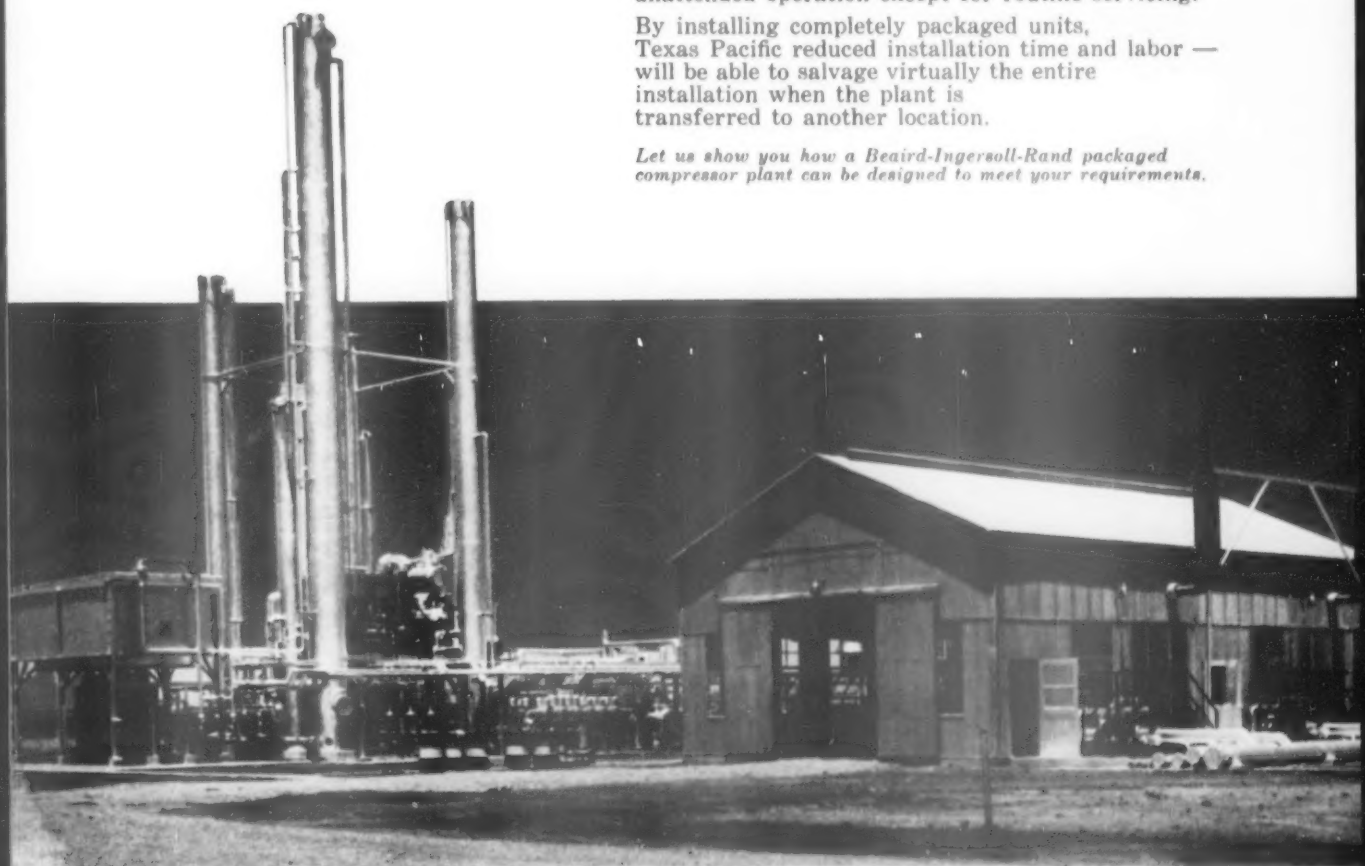
PACKAGED COMPRESSORS FOR GASOLINE PLANT

TEXAS PACIFIC COAL AND OIL COMPANY recently opened a compression-refrigeration type gasoline plant near Hamlin, Texas. The multiple compression tasks required in this process were entrusted to two 550 h.p. Beaird-Ingersoll-Rand packaged compressor plants. Each unit uses three stages to raise raw gas from 0 to 530 psig. The fourth cylinder compresses propane used as a refrigerant in the process. Plant vapors are collected and delivered into the sales line by a fifth cylinder added to one of the compressor plants.

To assure continuous operation, Texas Pacific installed two packaged units rather than one large compressor of equal horsepower. Plant pressures and operations can be maintained, when necessary, by one unit, while the other unit is shut down for maintenance or repair — with the loss of only a portion of the plant's total producing capacity. Automatic controls built into the units permit their unattended operation except for routine servicing.

By installing completely packaged units, Texas Pacific reduced installation time and labor — will be able to salvage virtually the entire installation when the plant is transferred to another location.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your requirements.



Texas Pacific Coal and Oil Company's packaged compressor plant, Velta Plant, Fisher County, Texas—equipped with two Beaird-Ingersoll-Rand 550 h.p. 10 SVG FOUR CYCLE gas engine driven compressors, Young radiators and all necessary equipment and controls. Other sizes 110 to 660 h.p.

THE J. B. BEAIRD COMPANY, INC.

Shreveport, Louisiana

BEAIRD

MACHINING MANUFACTURING STEEL WAREHOUSE

PACKAGED COMPRESSOR PLANTS

CAST STEEL FITTINGS

PRESSURE BULK STORAGE

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

NEW

EXTRA CAPACITY

35,000 TO 75,000 GALLONS

BEAIRD PRESSURE STORAGE TANKS

Now . . . substantial savings can be made in pressure storage plant installations by specifying Beaird Extra Capacity Tanks – available in a range of sizes from 35,000 to 75,000 gallons. Extra capacity storage will save installation cost by – eliminating expensive duplication of fittings, connecting piping and reducing operating manpower. Designed to your individual plant requirements, Beaird Extra Capacity Pressure Storage Tanks provide maximum storage at lowest cost per gallon.

Other Beaird Pressure Storage Tanks are available in a range of standard sizes from 2,000 to 30,000 gallons. All pressure tanks are inspected, tested and X-rayed. Modern radiographic equipment at Beaird has put X-ray on a production line basis.

Write today for further information or quotation on Beaird Pressure Storage Tanks designed to fit your requirements.

Weighing only 138,000 pounds, this Beaird 70,000 gallon pressure storage tank is one of the largest in the industry. 130" in diameter and 107' 3" in length.

Over two hundred million gallons experience

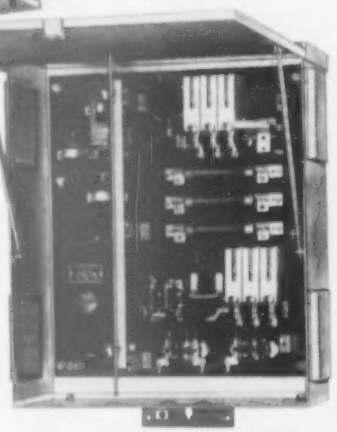
THE J. B. BEAIRD COMPANY, INC., SHREVEPORT, LOUISIANA

BEAIRD

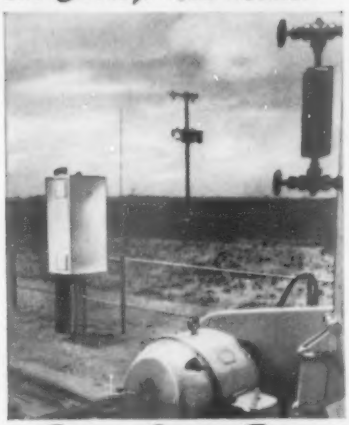
NEW CUTLER-HAMMER OIL WELL PUMPING CONTROL

Cutler-Hammer Program Time Switch for scheduling of pumping cycle automatically. Day-omission feature available.

Improved C-H Oil Well Pumping Control permits easy in-the-field modification to the type of restarting desired after power interruptions.



Lea County, New Mexico



Scurry County, Texas

Matrona County, Wyoming

Incorporates provisions for 3 types of starting. Permits in-the-field alteration to meet changing needs.

The *improved* Cutler-Hammer Oil Well Pumping Control is now ready. It provides the same important features which have made Cutler-Hammer Oil Well Pumping Control so widely preferred in the past. But in addition, it now permits easy *in-the-field* modification of each unit to include further operating features frequently desired.

Some oil well operations require a control that restarts a pump motor automatically after a power outage. Other operations make control equipped with low voltage relays desirable . . . so each pump motor is restarted manually after power is restored. Still others desire control units equipped with automatic timers to provide the same staggered restarting automatically.

The new Cutler-Hammer Oil Well Pumping Control permits the quick and easy incorporation of any of these restarting features by two changes in the basic construction of the unit. First, the panel of the control is drilled at the time of manufacture to allow easy mounting of either the low voltage relay or the automatic timer. Second, a diagram inside the cover shows all circuit arrangements with leads numbered to permit easy change of wiring. This new standardized construction does not alter the operation of the control when used WITHOUT relay or timer but does permit easy *in-the-field* incorporation of either of these features when desired.

And in this control you get the following widely preferred features. Aluminized case to repel sun's heat. Chimney-draft ventilation for cooler operation. Cool, dust-safe vertical contacts. Protected openings that keep out dirt, dust and bugs. Optional 3-coil overload protection against single phasing. Flexible program time switch for scheduling and for day omission. Non-"blow up" lightning arrestors, etc., etc., etc.

Ask to see this new control now. Or write for descriptive bulletin. CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wisc. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

MEMBER AMERICAN PETROLEUM INSTITUTE

CUTLER-HAMMER
MOTOR CONTROL
C-H

PICK BOOSTER POWER THAT NEEDS NO WATER, SLASHES OIL CONSUMPTION!

...Westinghouse 5000-hp Gas Turbine

Think what these two features alone mean to your operations! Lube oil consumption for both turbine and compressor is just a small fraction of that used by most boosters! And no cooling water is required, making it possible to put booster stations almost anywhere on the line, and greatly simplifying installation.

There are other features, too, which make Westinghouse Gas Turbines the lowest cost booster power available:

- ★ Up to 25% extra power — during winter months when demand is the greatest.
- ★ Lighter foundation — much less than for most boosters.
- ★ Simple to operate—need only one man per shift.
- ★ Inexpensive to maintain—turbine has extremely few moving parts, as much as 85% fewer than other boosters.
- ★ Single responsibility — Westinghouse integrates and sells a complete turbine-compressor booster, ready to install.

The savings these features offer you can make Westinghouse Gas Turbines a sound, low-cost choice for your next booster station. Your Westinghouse Salesman has complete data . . . call him or write: Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

J-50571

YOU CAN BE SURE... IF IT'S Westinghouse

Don Jenkins, Gas Turbine Sales Manager, points out two special gas turbine features which add up to big savings on gas pipeline booster operation.

JOHNSTON SELECTIVE ZONE TESTER

gives you all four with only one trip in the hole

ELIMINATES CEMENT PLUG! Packers above and below the testing zone seal it off, special control assures accurate results!

TESTS MORE THAN ONE ZONE in a single trip . . . and the Selective Zone Tester has been field proven in actual service in many areas.

TESTS ZONES YOU PASS UP to allow running a DST on other possibly productive levels. Even pinpoints gas/oil and water/oil contacts in just one trip!

TESTS WITHOUT TAIL PIPE, and at any level! You save rig time, save money, get a more accurate test than ever before.

AVAILABLE everywhere
ACCURATE every time

JOHNSTON TESTERS, INC.
HOUSTON, TEXAS

Gentlemen:
At no obligation, please rush complete information on the Johnston Selective Zone Tester.

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

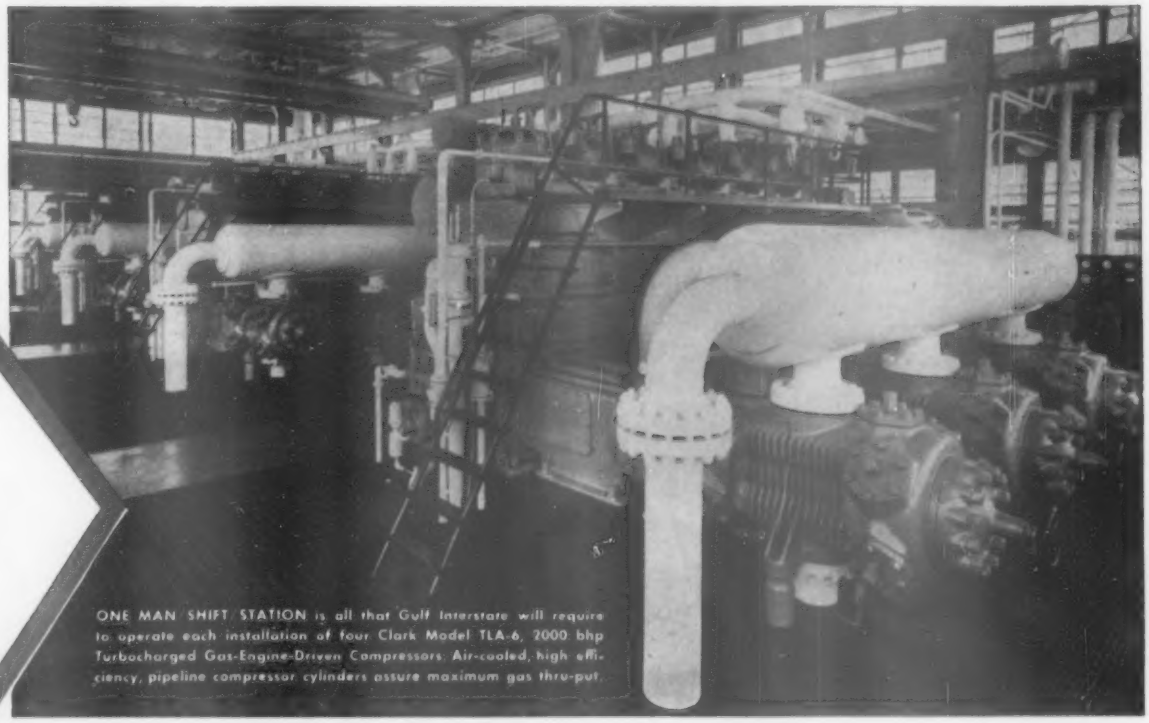
LOS ANGELES, CALIF. • CALGARY, CAN.

FORMATION AND CASING TESTING — JOHNSTON

Here's the pattern for gas transmission pipeline compressor stations of the future!

NEW GULF INTERSTATE SYSTEM

Selects the Clark Turbocharged Model TLA-6 for its Automatic, Push-Button Operated Stations



ONE MAN SHIFT STATION is all that Gulf Interstate will require to operate each installation of four Clark Model TLA-6, 2000 bhp Turbocharged Gas-Engine-Driven Compressors. Air-cooled, high efficiency, pipeline compressor cylinders assure maximum gas thru-put.

It's already an accepted fact that the Gulf Interstate Gas Company has changed the pattern for natural gas transmission with its one man, push-button controlled, automatic compressor stations.

With such advanced thinking, it's only natural that Gulf Interstate will be the first to use the NEW Clark Model TLA, 2000 bhp, Turbocharged Compressors in conjunction with their newly developed system of controls.

Gulf Interstate's control devices for automatic operation of these Clark Compressors did not appreciably increase the installed cost.

If you're interested in a compressor station that can be operated with the highest possible efficiency — *automatically* — while still maintaining station-loading flexibility, be sure you investigate Clark Models TRA and TLA Compressors. There are 8 sizes in a range of 825-3300 bhp. Ask your nearest Clark representative for Bulletins 130 and 134.

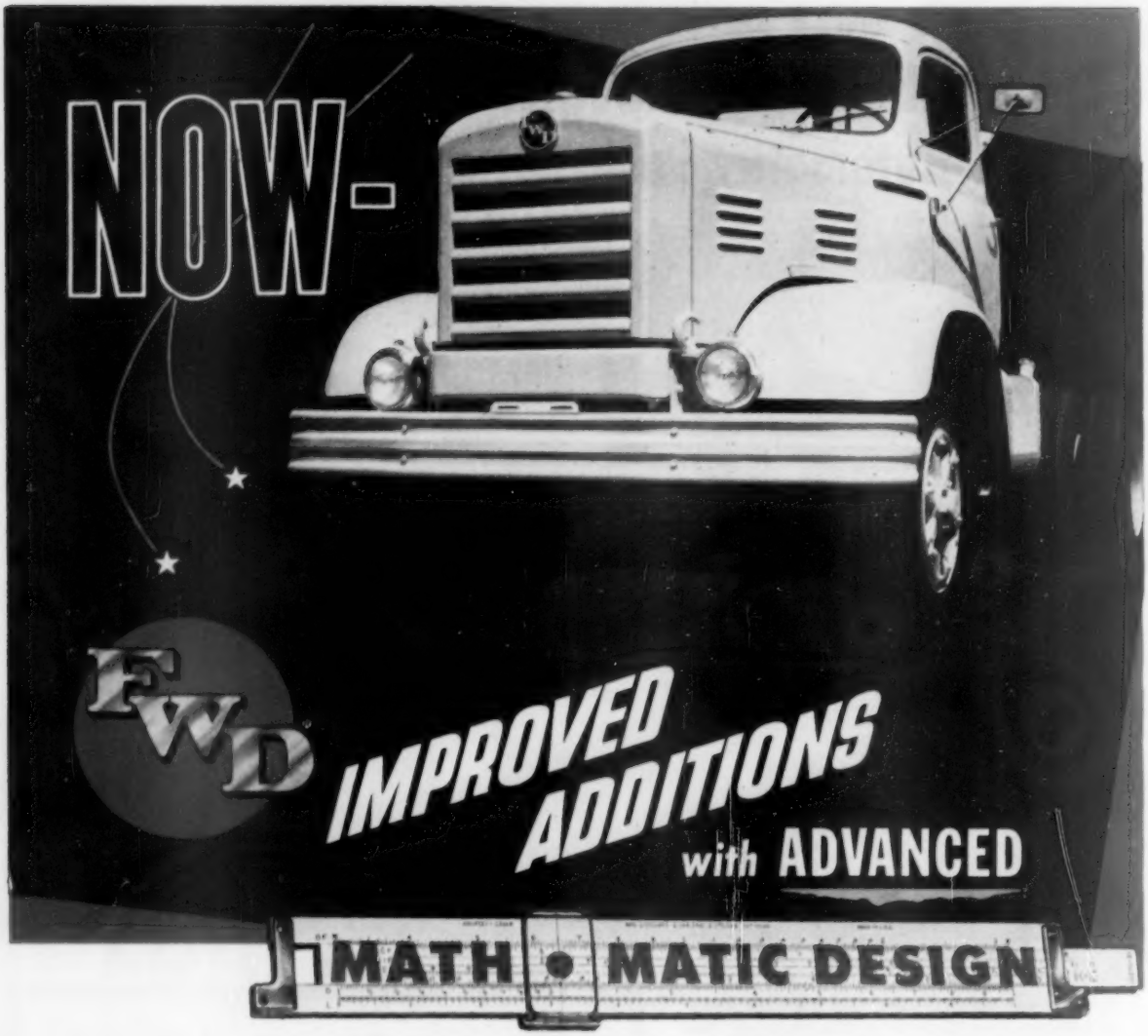
CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World

A dozen ways you'll be ahead with Clark TLA's

- 7000 btu/bhp/h fuel consumption.
- 40% less cooling required.
- 25-30% lower installation cost.
- Drastic reduction in number of moving parts.
- 90% engine mechanical efficiency.
- Detonation-free operation under all climatic conditions.
- Generous temporary overload capacity.
- Specifically designed for turbocharging.
- Low cycle temperatures for maximum cylinder and ring life.
- Only one turbocharger per unit.
- Unapproached for accessibility.
- 2-cycle simplicity, dependability.

CLARK compressors

Clark sets the pace in compressor progress



Every pound *helps haul itself* on these advanced FWD trucks. That's because it's "working weight." Improved Math-Matic Design—*exclusive* on FWD's—correctly proportions power to weight on front and rear axles. Each wheel's load makes it *grip harder*, using every ounce of power for greater controllable traction *on* or *off* the road.

From 30 to 37% longer tire life* . . . up to 82% more tractive ability* . . . safest by far to operate under *any* driving conditions* . . . all these extra values without extra fuel consumption—here are dollar and *sense* reasons why *you* should get full facts immediately on this greatly advanced line of heavy-duty trucks. Four-wheel-drive and six-wheel-drive models for any "truck-killing" job

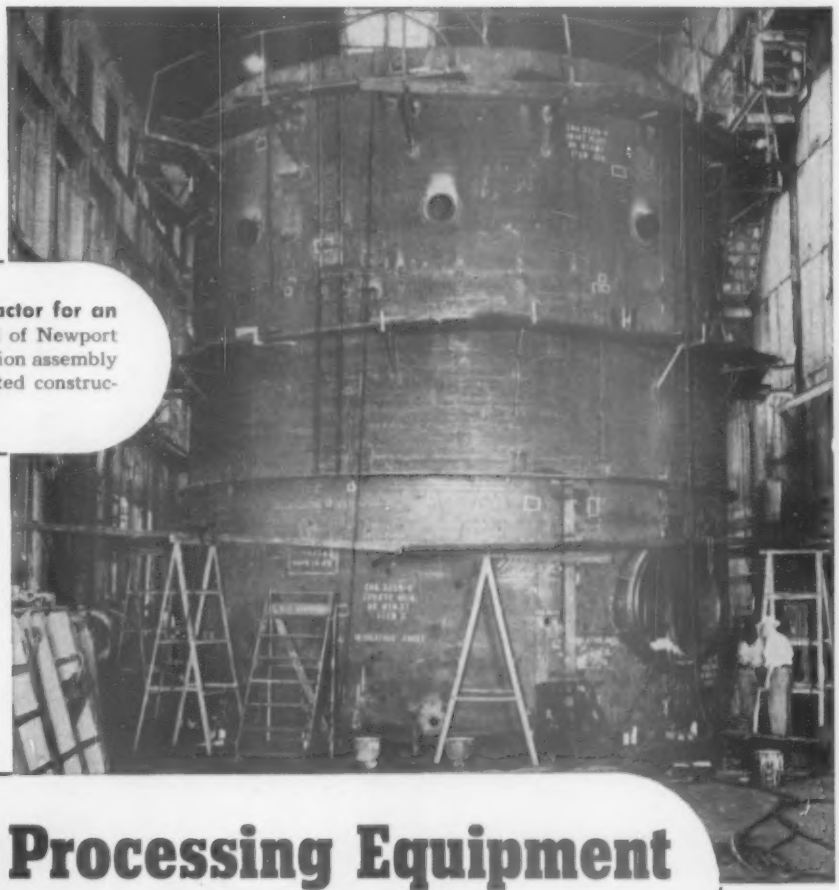
- ★ **Greater power-weight ratio, higher RPM, thru new engine design!**
- ★ **Lower maintenance costs because of standardized parts!**
- ★ **Larger legal payload thru better weight distribution!**
- ★ **New comfort—convenience—safety in completely redesigned cab!**

FWD — MATH-MATIC DESIGN

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

*TRUCK RESEARCH PROJECT CONCLUSIONS
Write now for your free copy of
"The Truck That Went To College."

THE FOUR WHEEL DRIVE AUTO COMPANY, CLINTONVILLE, WISCONSIN, *Canadian Factory,* KITCHENER, ONTARIO



Course number four of a reactor for an overseas oil refinery. Typical of Newport News plant methods, the precision assembly of this unit in the shop expedited construction of the reactor in the field.

Petroleum Processing Equipment

...Built by Specialists in Metal Fabrication

Careful attention to detail characterizes the work of Newport News craftsmen...

They've fabricated millions of tons of steel including corrosion-resistant alloy, clad and other special steels for many diverse industries.

Newport News handles the job exactly as you want it done, for maximum results per dollar invested.

Specialized production techniques, advanced plant methods and a complete range of facilities along with many special purpose machines contribute to the excellence of Newport News fabrication.

Let us bid on equipment for your present or future projects. Learn how Newport News can help you...send for our booklet entitled "Facilities and Products." It's yours for the asking.

Newport News Shipbuilding and Dry Dock Company

Newport News, Virginia

Continental Red Seal®

MEANS MORE AND BETTER POWER

The equipment builder who powers his product with Continental Red Seal engine – and the user of such equipment–both benefit from specialized experience that goes back a long, long time. They profit by engineering features, and advances in production technique, evolved over a period of more than 50 years. Ever since 1902, Continental dependability, economy, and stamina have been building prestige for quality leaders in the transportation, farm and industrial equipment fields–in oil field producing, distribution, processing . . . providing more and better power, at lower over-all cost.

A COMPLETE LINE OF 4-CYCLE AIR-COOLED ENGINES

Continental also builds air-cooled models, from 2 to 3 h.p., for heavy-duty applications in industry and on the farm. They embody the exclusive Contex® external ignition system, greatest air-cooled engine advance in recent years. For information, address Air-Cooled Industrial Engine Division, 12800 Kercheval Avenue, Detroit 15, Michigan.

8 EAST 45TH ST., NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 S. SANTA FE AVE., LOS ANGELES 58, CALIF.
910 S. BOSTON ST., ROOM 1000, TULSA, OKLA. • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GA.

Continental Motors Corporation

MUSKEGON, MICHIGAN

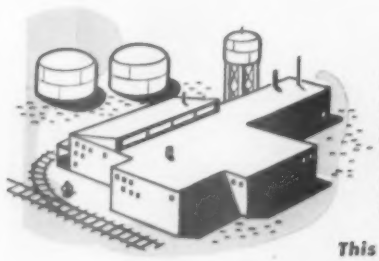
PARTS AND SERVICE COAST TO COAST

Paint on Protection

WITH "Liquid Aluminum"

Paint metallic protection on your costly buildings and equipment with *Liquid Aluminum*. It protects them against ruinous rust and against smoke and fumes, too. Its high reflectivity (up to 85% of heat and light rays) decreases evaporation . . . guards against loss of volatiles. *Liquid Aluminum's* sparkling appearance brightens as it protects. From rig to retail outlet protect and enhance your investment with *Liquid Aluminum*. There's no easier, more economical or efficient way.

Look for the *Liquid Aluminum* shining foil label on the aluminum paint you choose. It's made to approved minimum standards that have been adopted by the many paint manufacturers who make *Liquid Aluminum*. These standards assure you of the best combination of elasticity and durability for longest life on most painting applications. Ask your paint supplier or write for names of manufacturers to *Reynolds Metals Company, 2595 South Third Street, Louisville 1, Kentucky.*



ONE-COAT PROTECTION FOR YOUR BUILT-UP OR RUSTABLE METAL ROOFS

It's *Liquid Aluminum* Roof Paint or Coating with this shining foil label and this warranty. They are your assurance of the best combination of elasticity and durability for long roof life. Aluminum reflects harmful sun rays to protect asphalt base against deterioration. Write for folder.

This advertisement appears in the interest of the Paint Industry of America

Gilbarco

West Springfield, Mass.
Toronto, Canada

Gilbert & Barker Mfg. Co.
West Springfield, Mass.

Gentlemen:

Please send me brochure on the Gilbarco Electronic Tank Gauge.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

NOW YOU CAN MAINTAIN 100% GREATER ACCURACY

This coupon will bring you full information on a revolutionary

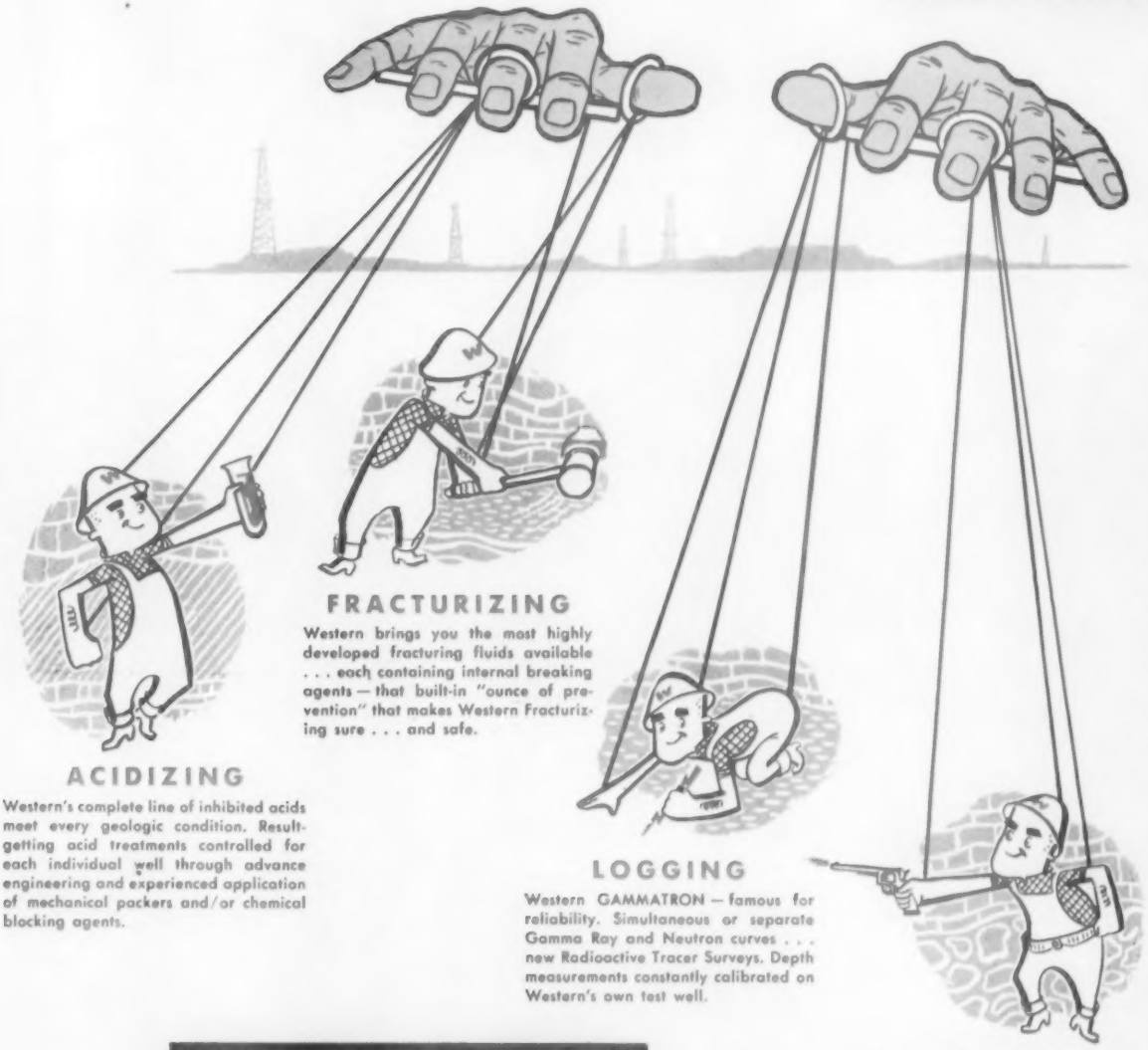
NEW ELECTRONIC TANK GAUGE

The new Gilbarco Electronic Tank Gauge, the result of years of laboratory research and field testing, actually *measures electronically*. No adjustments needed for varying specific gravities or viscosities. Can be installed *without* taking tank out of service. Liquid is measured with a degree of accuracy never before approached by any other method of gauging. And equally accurate readings can be made at remote points. Get full information on this revolutionary new gauge *today*.

Capable Western Hands

Make Your Pay-Pay Out

WESTERN
Engineered
WELL SERVICES



FRACTURIZING

Western brings you the most highly developed fracturing fluids available . . . each containing internal breaking agents — that built-in "ounce of prevention" that makes Western Fracturizing sure . . . and safe.

ACIDIZING

Western's complete line of inhibited acids meet every geologic condition. Result-getting acid treatments controlled for each individual well through advance engineering and experienced application of mechanical packers and/or chemical blocking agents.

LOGGING

Western GAMMATRON — famous for reliability. Simultaneous or separate Gamma Ray and Neutron curves . . . new Radioactive Tracer Surveys. Depth measurements constantly calibrated on Western's own test well.

PERFORATING

Complete range of jet and bullet perforating gun sizes and other wire line services. All Western guns engineered for maximum penetration . . . maximum safety. Western perforating service has made "results" the rule.

Behind every Western service are hands . . . hands at constant research — hands at delicate instruments . . . hands made sure by knowledge and experience directing every detail of Western Engineered services . . . to make your pay . . . PAY OUT FASTER.

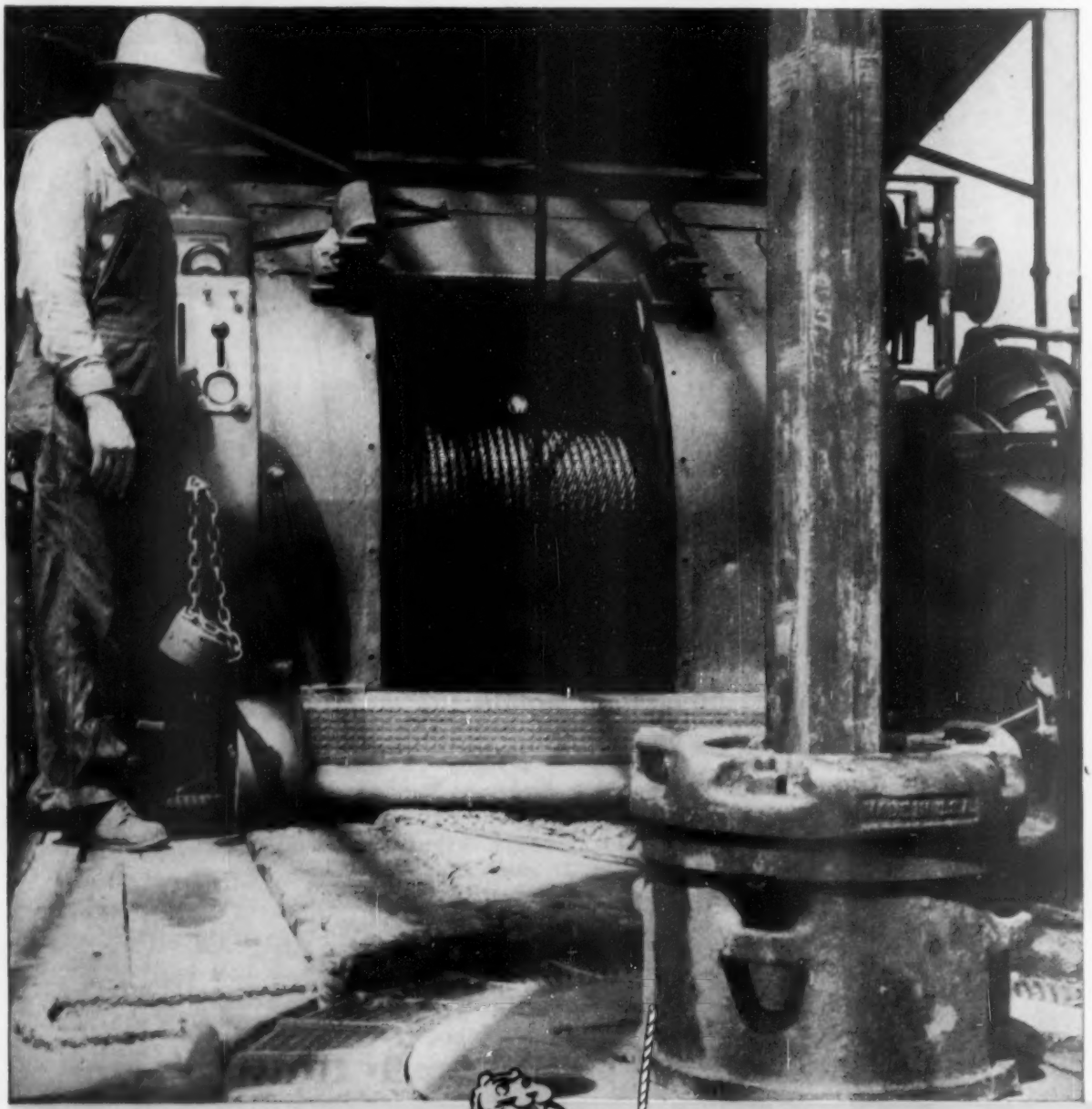
THE WESTERN COMPANY

Engineered Well Services

GENERAL OFFICES: Midland, Texas

TEXAS: Ballinger, Borger, Levelland, Odessa, Seagraves, Snyder; KANSAS: Ulysses; NEW MEXICO: Hobbs; OKLAHOMA: Healdton, Cushing.

Tiger Brand Rotary Lines



The Right Wire Rope will do the trick!

prove again and again that they give long service

Ask any driller who has used Tiger Brand Wire Lines and he'll tell you how good they are. He'll tell you that they give extremely long, trouble-free service.

We know of one Tiger Brand Rotary Line that gave 89,625 ton-miles of service before it was replaced . . . another that was used on nine wells, for a total of 93,919 ft. of hole . . . and many others that have comparable service records.

Facts like these prove the high quality and reliability of Tiger Brand Rotary Lines; so ask for Tiger Brand specifically next time you need line. And don't forget Tiger Brand Cable Tool Lines, Sand Lines, Coring Lines, Winch Lines, Torpedo Lines, and Hoisting Rope. These are just as dependable as our Rotary Lines; they are made just as carefully; and they, too, will give you excellent service. All Tiger Brand Wire Lines for oil and gas field usage are made to A.P.I. standards.

Send the coupon for complete information.

American Steel & Wire
Room 842, Rockefeller Building
Cleveland 13, Ohio

Please send me your information-packed booklet "Wire Lines for Oil, Gas, and Water Wells." I understand there's no charge.

Name ..... Position .....

Company .....

City and State .....

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

19 of 24 ENGINE MANUFACTURERS

Apply

ROCKFORD POWER TAKE-OFFS

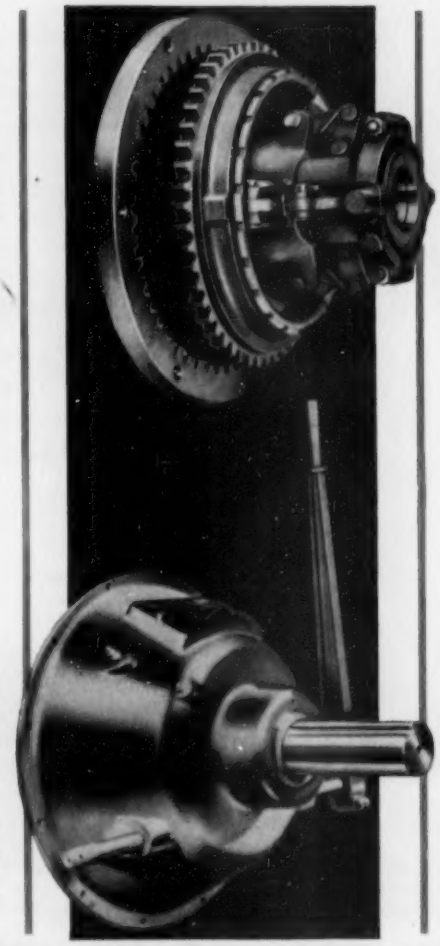
As Original Equipment on

THEIR OIL FIELD ENGINES

BECAUSE of their adaptability to heavy-duty, oil field service, ROCKFORD POWER TAKE-OFFS are used by 19 out of 24 engine manufacturers selling to oil producers. Gear-tooth drive — convenience of adjustment — and trouble-free operation make these low-cost Power Take-Offs best suited for the shock loads and constant pounding of oil field use. Capacities range from 125 to 2100 foot pounds torque. Sizes fit standard S.A.E. flywheel housings. It will pay you to specify "ROCKFORD" when ordering your next engine or equipment.

Send for This Handy Bulletin

Shows typical Installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains Diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.



These ROCKFORD DISTRIBUTORS and DEALERS carry a stock of clutches, power take-offs and replacement parts to insure ROCKFORD clutch users prompt delivery and service.

Continental Sales & Service Company, Los Angeles, Calif.
Lightbourn Equipment Company, Dallas, Texas
Atlas Auto Parts & Grinding Co., Louisville, Kentucky
Wepco Equipment Company, Cleveland, Ohio
Genuine Motor Parts, Pittsburg, Pa.
Auto Clutch & Parts Company, Chicago, Illinois
Auto Gear & Parts Company, Philadelphia, Pa.
General Machine Parts, New York, N. Y.
Highway & Industrial Equipment Co., Inc. Raleigh, N. Carolina
R. Angus (Alberta) Ltd., Edmonton, Alberta, Canada
Maase Equipment Co., Ltd. Montreal, Canada
Quebec City Gas & Diesel Engine Ltd. Quebec City, Canada
B-W-H Service Parts, Ltd., Merritton, Ontario, Canada
Credle Equipment Company Utica, New York
Engine Service & Supply Company Odessa, Texas
National Supply Engine Corp. Portland, Ore. and Seattle, Wash.

Wherever industry uses heavy duty clutches or power take-offs there is a ROCKFORD distributor conveniently close at hand to supply ROCKFORD Heavy Duty CLUTCHES, POWER TAKE-OFFS and replacement PARTS for numerous types and sizes of each.

ROCKFORD CLUTCH DIVISION

Borg-Warner - 1305 Eighteenth Ave., Rockford, Illinois

. . . on most of the important oil and gas TRANSMISSION LINES

LimiTorque is the most widely used automatic valve operator in the world. Thousands are operating day and night in Refineries, Central Stations, Private Power Plants and Pipe Lines from Saudi Arabia to Texas. These valve controls are self-contained and are applicable to all types of valves. The wide preference of petroleum and gas pipe line owners and operators for LimiTorque Controls stems from proven performance under all service and climatic conditions.

For all types of pipe line or refining valves . . . LimiTorque can provide the right control. Any available power source such as electricity, air, steam, oil, water or gas may be used.

On many recent pipelines the high pressure gas in the lines has been utilized as a power source.

LimiTorque Motor Operated Valves are readily adapted to Microwave Control.

They operate by the mere "push of a button"

There is no guesswork or labor connected with LimiTorque Remote Valve Control . . . just a push of a button enables one key man to open and close any type of valve quickly and dependably in remote or hazardous locations from convenient and strategically placed control panels. Thus, vital refinery and pipe line operating procedure can be handled easily, safely and give full protection from damage during closing cycle by the torque limiting mechanism.

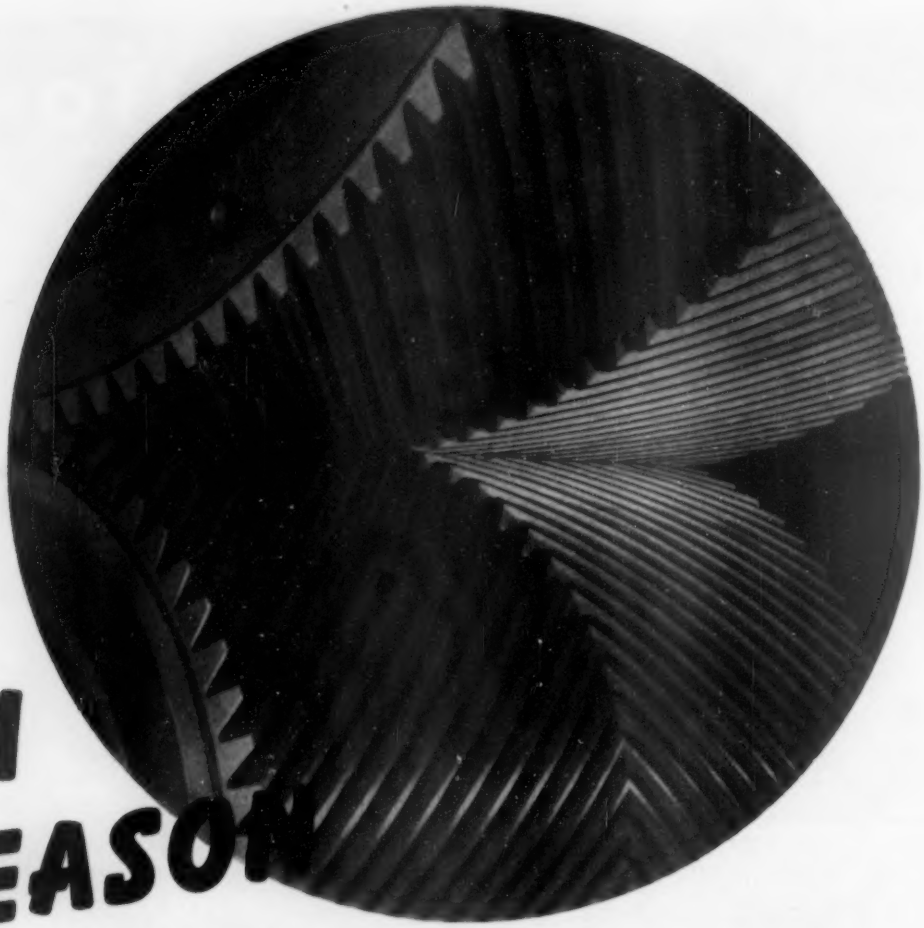
Send for Catalog L-54 for details.

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

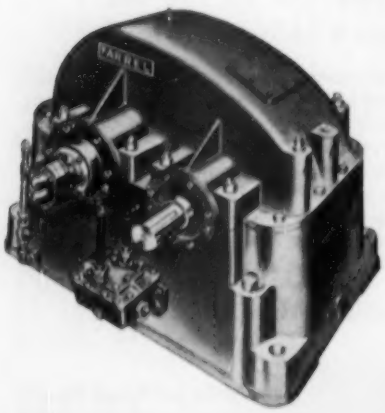
Industrial Gears & Speed Reducers

LimiTorque Valve Controls



NO. 1 REASON

why Farrel® speed increasers give nonstop service



The gears in a Farrel speed increaser are precision-generated by the famous Farrel-Sykes method—a process that assures extreme accuracy of tooth spacing, profile and helix angle. This high precision provides a virtual guarantee of long, trouble-free operation.

The continuous tooth herringbone design of the gears, assures evenly distributed pressure over each tooth, from tip to working depth line. Because this reduces the tendency of the teeth to wear unevenly, speed increaser life is prolonged.

Proof of the dependability of Farrel speed increasers is found in the record. Since 1932, when they were first put into service, not a single unit has ever had to be replaced.

For details of these *proved-on-the-job* speed increasers send for bulletin 448-A.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Fayetteville (N. C.), Los Angeles, Salt Lake City, New Orleans

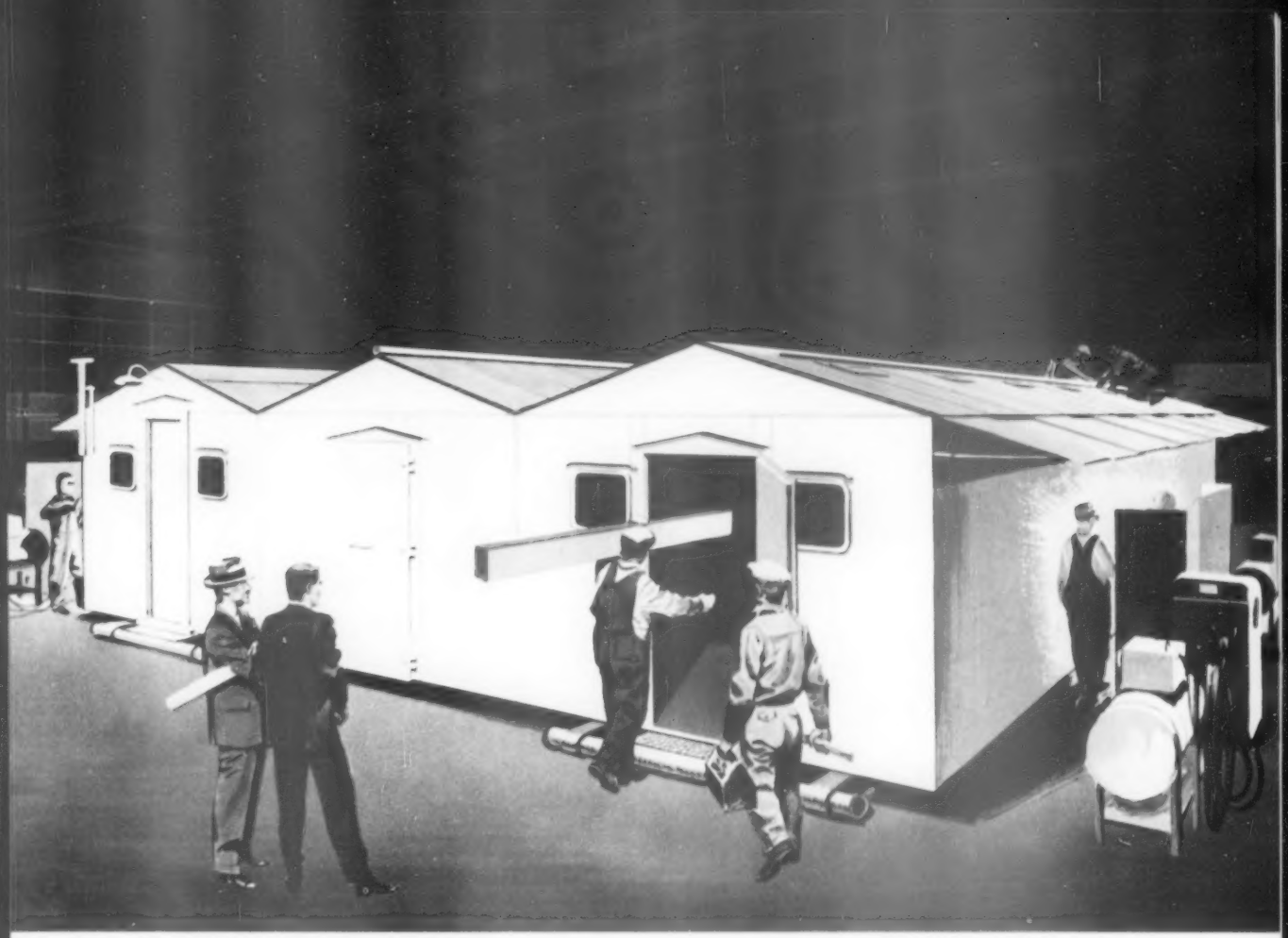
OIL FIELD REPRESENTATIVES:

Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.

V. W. Osborne, 860-A M&M Building, Houston 2, Texas

FB-943

Farrel-Birmingham ®



Research serves "customer service" too!

Continuous equipment experiments and research projects are a normal and necessary part of National Supply's oil field products manufacturing plants. But we go a step further in our dual role as oil country's largest equipment manufacturer *and supplier* . . . by also keeping constantly aware of oil field supply problems and using "research" to improve the brand of service you receive.

Illustrated above is a good example of this kind of research in action. To answer the problem of supplying remote Canadian drilling areas quickly, National Supply engineers developed a "portable" supply store. Prefabricated complete with shelves and racks, this store breaks down into four truck loads (including a substantial stock of supply items) and can be erected and ready for business in approximately three days.

Research on customer service isn't confined to Canada only. Day after day, National Supply stores in your own area adopt new methods and improvements aimed at only one thing—giving you the *best supply service* in oil country—everywhere.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

THE
NATIONAL SUPPLY
COMPANY

PITTSBURGH 30, PENNSYLVANIA

Here's STAMINA for the toughest well conditions!

SPANGWELD®
DRILL PIPE

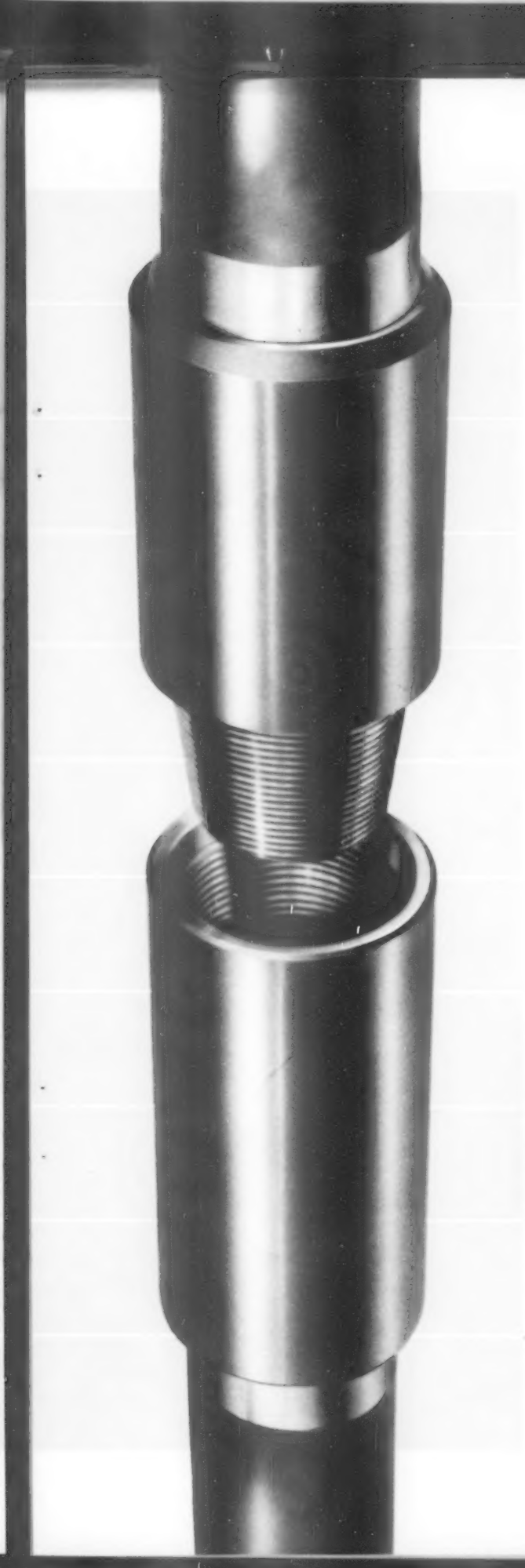
For a quality drill pipe that meets the severe tests of modern deep well operations, oil men rely on Spangweld Drill Pipe. They choose it for these outstanding advantages:

- **Economy.**
- **Reduced threaded connections—taper joint only is threaded.**
- **High Strength Welds of high quality, uniformity and strength.**
- **Abrasion resistant—hard faced joints are available.**
- **Streamlined contour.**
- **Full size range—all common sizes and types, plus minimum diameter ratios for slim hole operations.**

For complete details on Spangweld Drill Pipe for your next well, call the nearest National Supply Division Tubular Office shown on the next page.

CORROSION RESISTANT PLASTIC COATING AVAILABLE FOR SPANG DRILL PIPE

To increase corrosion resistance, a phenolic plastic coating can be applied at the mill on all Spang Drill Pipe and Tubing. Ask the National Supply Representative about this Spang service.



SPANG®

DOUBLE SEAL SHRINK THREAD DRILL PIPE

Developed to withstand the stresses of modern drilling operations, Spang Double Seal Shrink Thread Drill Pipe means dependable and economical performance in every well. The precision metal-to-metal seal in the Spang Double Seal joint provides these outstanding advantages:

- **Elimination of last engaged thread failure.**
- **Avoids creepage during drilling.**
- **Prevents fluid entry into threads with an external seal.**
- **Eliminates leakage and washout with an internal seal.**
- **Can be rapidly replaced at the rig.**

Get the complete facts and proven performance records on Spang Double Seal Shrink Thread Drill Pipe from the nearest National Supply Division Tubular Office listed below.

First in quality
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

Spang-Chalfant Division

THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

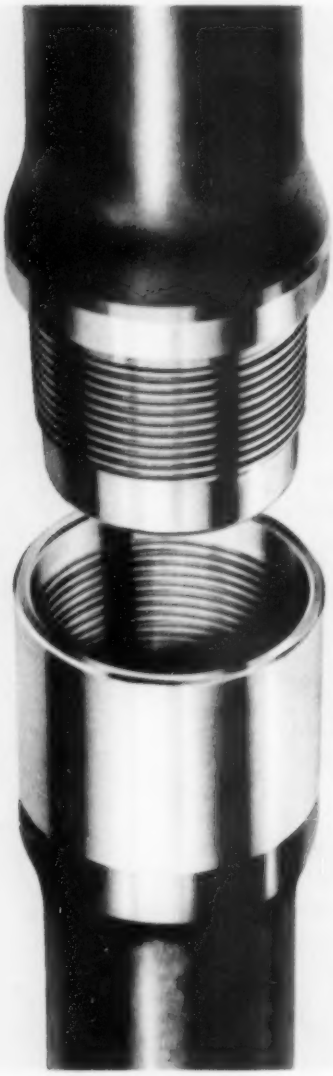
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Pittsburgh, Pennsylvania; Tulsa, Oklahoma; Calgary, Alberta, Canada

See next page for information on

quality SPANG TUBING

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE
SUPERIOR & ATLAS ENGINES

withstands high pressures . . . reduces remedial jobs!



SPANG EXTREME LINE TUBING

provides these advantages:

- **Maximum running speed; fast joint make-up**
- **100% Joint strength**
- **Maximum leakage resistance**
- **50% less connections**
- **Positive shoulder contact engagement**
- **Streamlined exterior**

SPANGSEAL TUBING

provides these advantages:

- **50% less connections**
- **Maximum leakage resistance**
- **More hole clearance**
- **Elimination of "hanging-up"**
- **Streamlined exterior**

The exceptional quality of Spangseal and Spang Extreme Line Tubing in handling unusual well operating conditions is verified not only by Spang's continuous "extreme condition" plant tests . . . but by customers' performance reports as well.

You can get complete information on the Spang family of tubular products, which includes Spangweld Drill Pipe, Spang Double Seal Shrink Thread Drill Pipe and Spang Extreme Line Casing, from the local National Supply Division Tubular representative or office listed below.

First in quality...
First in supply service
in oil country everywhere

NATIONAL BLUE PRODUCTS

Spang-Chalfant Division

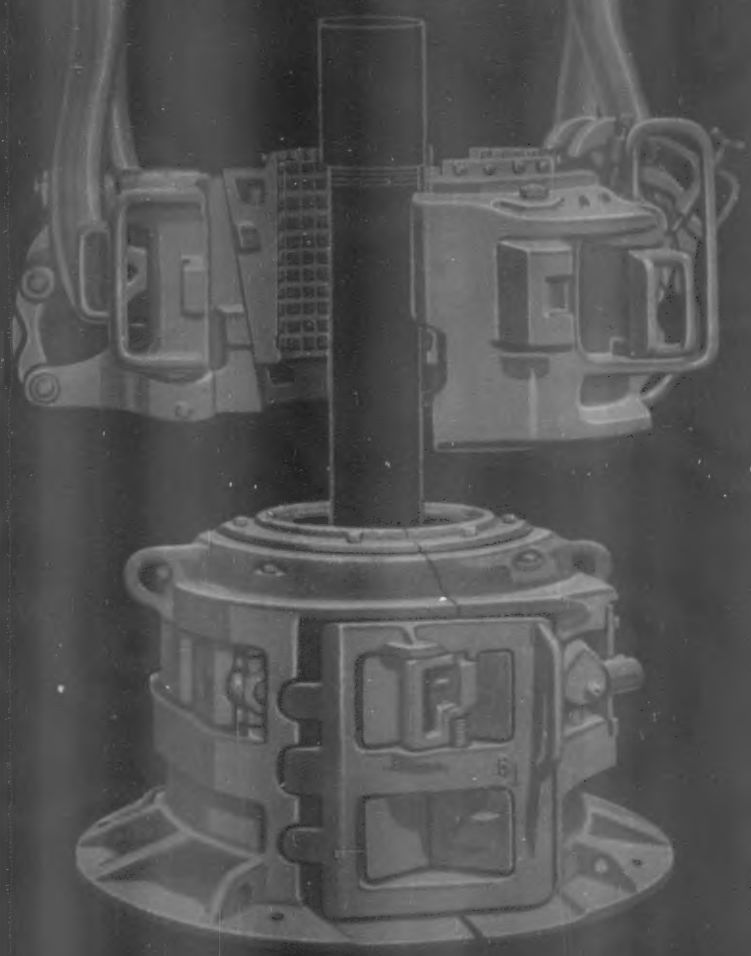
THE NATIONAL SUPPLY COMPANY

PITTSBURGH 30, PENNSYLVANIA

DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Pittsburgh, Pennsylvania; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

run casing with confidence



BJ

Casing ELEVATORS

Casing SPIDER

Tools of our Trade No. 10

BJ MEANS ENGINEERED OIL TOOLS

BJ PB

Byron Jackson Co. *Since 1872*

LOS ANGELES NEW YORK FORT WORTH HOUSTON

Sure, that old pump still works,

but how much does it cost to keep?

That rugged old pump of yours may not be the bargain that it seems. Let's do some arithmetic. If the efficiency of the old pump is 75% vs. the 85% efficiency of the new pump, you are paying more to keep it than you would to replace it. That's because a new unit of equivalent output uses less power. Thus it soon saves its own cost — then begins to pay dividends.

Let's take a specific example—a general service pump

Old pump efficiency 84%	625 BHP
New pump efficiency 89%	590 BHP
	35 BHP Saving

On the basis of 1¢ per KWH, the 35 BHP saving for a 5000-hour year (approximately 14 hours per day) amounts to $1300. This saving, capitalized in 4 years at 4% adds up to $5520. Yet the price of the new pump that saves $5520 is only $4054.

What would the pump replacement profit be in your particular case? Your De Laval representative can tell you exactly — in dollars and cents — as soon as he has the basic facts on your present installation. Call him in today or write to De Laval for Pump Fax Bulletin which includes a valuable "power-savings" chart.

DE LAVAL *Pumps*

DE LAVAL STEAM TURBINE COMPANY
810 Nottingham Way, Trenton 2, New Jersey

DL-111C

Entire 8,800-Acre Field Containing 2,300 Wells Now Served By Two BS&B Waterflood Treating Plants

An Actual Case History From Our Files

Two recently completed BS&B Waterflood Treating Plants are now serving the operators* of the unitized Lake Centralia-Salem Oil Field, approximately 6½ miles long and 2½ miles wide, in southern Illinois.

PROBLEM: At the time of unitization, this field contained more than 365 tank batteries servicing approximately 2,300 wells. Most of these tank batteries were 10 years old or more, and with gas depletion and the necessity for installing gathering lines for waterflooding, a unique treating problem was presented.

SOLUTION: It was decided to consolidate the entire production through two large treating plants, each of which was to have an initial design capacity of 10,000 BOPD and 35,000 BWPD, with an ultimate capacity of 30,000 BOPD and 115,000 BWPD. Each plant was to consist of the following basic items of equipment:

- **1 BS&B 10′ x 28′ Freewater Knockout**
- **2 BS&B 70LSH Steam Generators**
- **2 BS&B 30″ x 21′ x 6″ Heat Exchangers**
- **2 BS&B 21′-6″ x 32′-2″ 2,000 Bbl. Settling Tanks**
- **4 BS&B 38′-7¾″ x 24′-1½″ 5,000 Bbl. Stock Tanks**

Plants were to be so constructed that equipment could be added or removed without interrupting operations. Water of 1.05 specific gravity was to be removed from oil of approximately 37° API.

RESULT: Test results on these plants have been most satisfactory. Heat exchangers were transferring 2,000,000 BTU/Hr./heat exchanger under medium load with only one steam generator firing. Water carry over from the freewater knockout was less than 1%. The grind outs do not exceed .002 to .003%.

* Name supplied on request.

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-A11

1708 West Main Street • Oklahoma City, Oklahoma

EFFICIENCY OVER 60 YEARS **BS&B** RELIABILITY

ENTIRELY NEW!

APPLETON

Explosion-Proof! Dust-Tight! Rain-Tight!

CIRCUIT BREAKER, MOTOR STARTER and COMBINATION MOTOR STARTER

UNILETS

REG. U.S. PAT. OFF.

Illustration shows the high safety factor, versatility, and space-saving attributes of *Appleton* explosion-proof circuit breaker and motor starter *Unilet* Combinations. Your own installation needs, no matter what they may be, can also be met with these remarkable new Unilets.

BREAKER LOCKED IN "OFF" POSITION

MOTOR STARTER NO. 5 . . . EXPOSED FOR **SAFE** MAINTENANCE . . . but no "down time" on other operating equipment

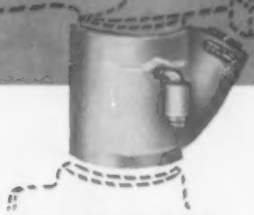
SAFE ENTRANCE TO MOTOR STARTER WITHOUT DISCONNECTING OTHER BRANCH CIRCUITS . . . ONLY *APPLETON UNILETS* HAVE THIS FEATURE!

U. L. APPROVED

"CB" Circuit Breaker UNILETS

Assure easy, safe, flexible, and economical installation for protection of service entrance, feeder or lighting, appliance, and branch circuit conductors up to 225 amperes. U. L. Approved individually and in banked groups up to three for forms 1 and 2 without using dividing seal.

U. L. APPROVED



Sealing UNILETS

Available for use as explosion-proof seal where needed on circuit breaker and motor starter Unilets. This Sealing Unilet is furnished on all Combination Motor Starters, and when properly sealed permits safe entrance to a motor starter in single or banked combination installations, without disconnecting other branch circuits.

U. L. APPROVED

"LS" Motor Starter UNILETS

For 3-phase induction motor control up to 100 H.P. at 600 volts maximum. Lightweight construction of larger sizes eliminates need for heavy lift equipment . . . assures easy, time-saving, inexpensive installation. Also made for reversing and two-speed motors.

The greatest advance in explosion-proof design in years!

You expect more from *Appleton,* and you get it! The proof lies in these completely new and different *Appleton* circuit breaker and motor starter *Unilets.* Alone or in combination, their design, construction, and performance give you maximum safety, unparalleled ease of wiring, installation and maintenance, and initial and long-term money savings not available with any other equipment! You'll find their exclusive features invaluable on any hazardous-location motor control or power lead-in installation, large or small, indoors or outdoors, where tricky wiring, corrosive and flammable atmospheres, dust, or weather difficulties appear insurmountable. Where absolute safety is required day in and day out and every minute of the day, you can place complete confidence in *Appleton Unilets.*

IMPORTANT ADVANTAGES

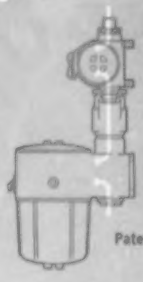
- **FIRST to be U. L. Approved for BANKED Circuit Breaker Grouping**
- **Combinations Meet U. L. Requirements through Approval of Components**
- **FIRST to Achieve Safe Entrance to Motor Starter of a Combination without Shutting Off Other Branch Circuits**
- **Full 7-Thread Explosion-Proof Protection . . . No Bolts to Strip or Flanges to Nick**
- **Unmatched Accessability for Easiest Wiring and Servicing on Every Job**
- **Light-Weight Construction for Easy Installation without Heavy Lift Equipment**
- **Quick Interchange on All Leading Makes of Circuit Breakers and Motor Starters**
- **Flexible Field Set-ups Assured with Single and Duplex Male and Female Hub Adapters**

BANKED CIRCUIT BREAKER GROUPING

Male to female hubs permit easy grouping. Cuts costs, streamlines panel set-ups, assures coordinated control without sacrificing safety. U. L. Approved up to groups of three in smaller size Unilets.

OVER-SIZE CONDUIT and CONDUCTORS

May be run with hub adapters for subsequent installation of higher rated breakers without replacing complete Unilet or existing conduit.



VERTICAL "STRAIGHT-THRU" DESIGN

Simplifies wire pulling, saves time. Ample working space eliminates need to remove breaker mechanism from enclosure, yet assures clean, safe wiring.

Patent Applied For

PUSH-BUTTON and PILOT DUTY CONTROL

Combines convenience and selectivity including built-in "Start-Stop," "Hand-Off-Auto.", or "Jog-Run-Off" control where needed.

Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC COMPANY

1718 Wellington Avenue, Chicago 13, Illinois

Also Manufacturers of:

Explosion-Proof Fixtures

Industrial Lighting

"ST" Liquid-Tight Connectors

Automatic Reelites

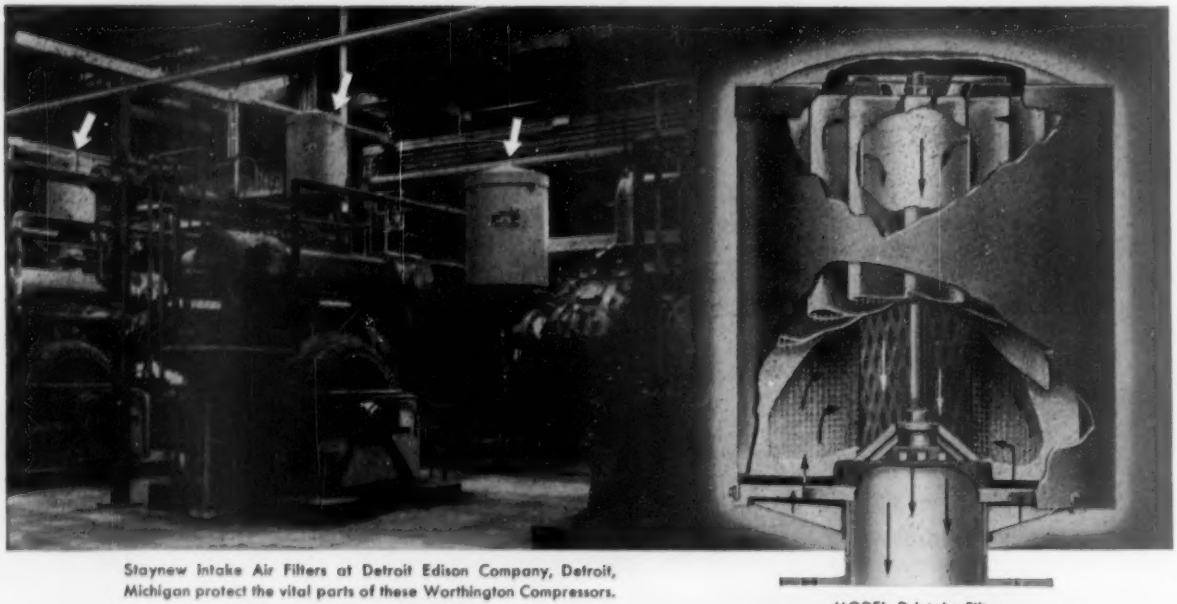
Outlet Boxes, Covers, Switch Boxes

Rely on APPLETON . . . *The Standard for Better Wiring*

WRITE TODAY FOR BULLETIN BH

A complete catalog section containing informative technical data.

STAYNEW INTAKE FILTERS



Staynew Intake Air Filters at Detroit Edison Company, Detroit, Michigan protect the vital parts of these Worthington Compressors.

MODEL D Intake Filter

KEEP COMPRESSORS YOUNG!

Your air compressing equipment demands the protection Staynew Intake Filters are designed to give. With Staynew, compressors, and internal combustion engines, blowers, motors and generators remain at peak efficiency years longer.

Staynew's "Positive Protection" keeps shutdowns and repairs at an absolute minimum. And Staynew itself requires less attention. The *dry-type* filtering medium has the ability to remove air-borne dust particles without the necessity of viscous filter aids.

Staynew Intake Filters efficiently protect vital engine parts without carefully held maintenance schedules. And where noise is a problem, Model DS Silencer Filters are available. To keep equipment young, always specify Staynew.

Write today for Staynew Catalog S.I.F.

Representatives in Principal Cities

- Positive Protection
- Efficiency Actually Increases with Use
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DAVISON M-S® Catalyst

The Petroleum Industry's MOST WIDELY USED CATALYST!

- Narrow range of particle size distribution
- Low impurities
- Outstanding physical and catalytic characteristics
- Excellent attrition resistance

These are some of the reasons why Davison's Catalysts are the most widely used synthetic cracking catalysts in the petroleum industry. Throughout the world, Davison's catalysts crack more gas oil than any other catalyst.

Write today for a folder giving all the facts on Davison's M-S Catalysts . . . particle size distribution, chemical, physical and catalytic properties, etc.

Progress Through Chemistry

DAVISON CHEMICAL COMPANY

Division of W. R. Grace & Co.

Baltimore 3, Maryland

Sales Offices: New York, N. Y.; Chicago, Ill.; Houston, Texas

Producers of: Catalysts, Inorganic Acids, Superphosphates, Triple Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides. Sole Producers of DAVCO® Granulated Fertilizers.

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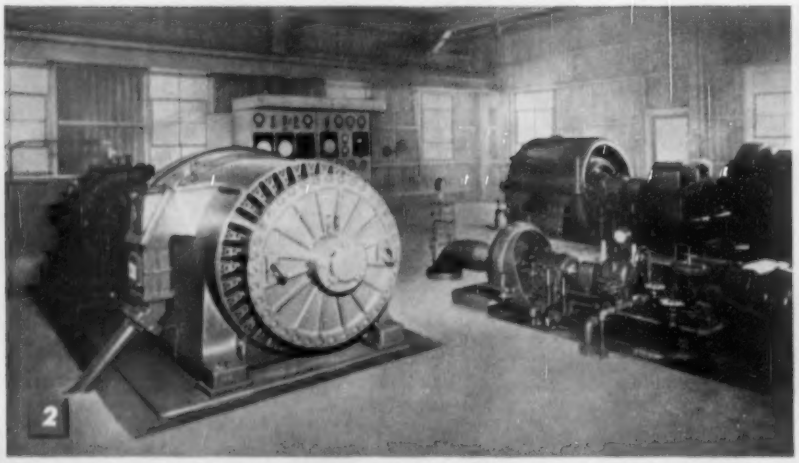
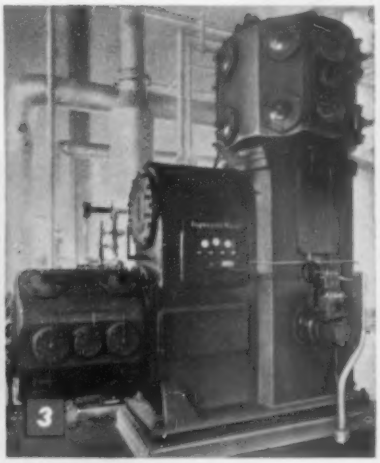
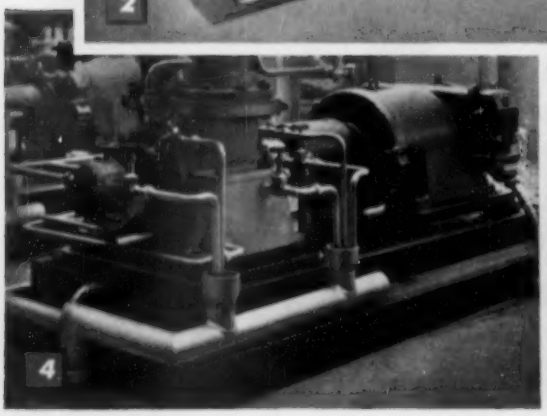
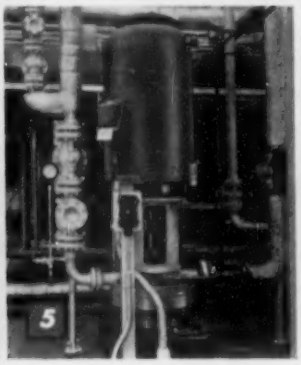
69 I-R PUMPS

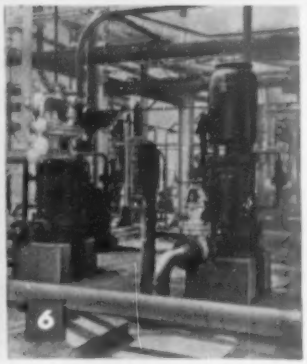
for practically all liquid-moving services

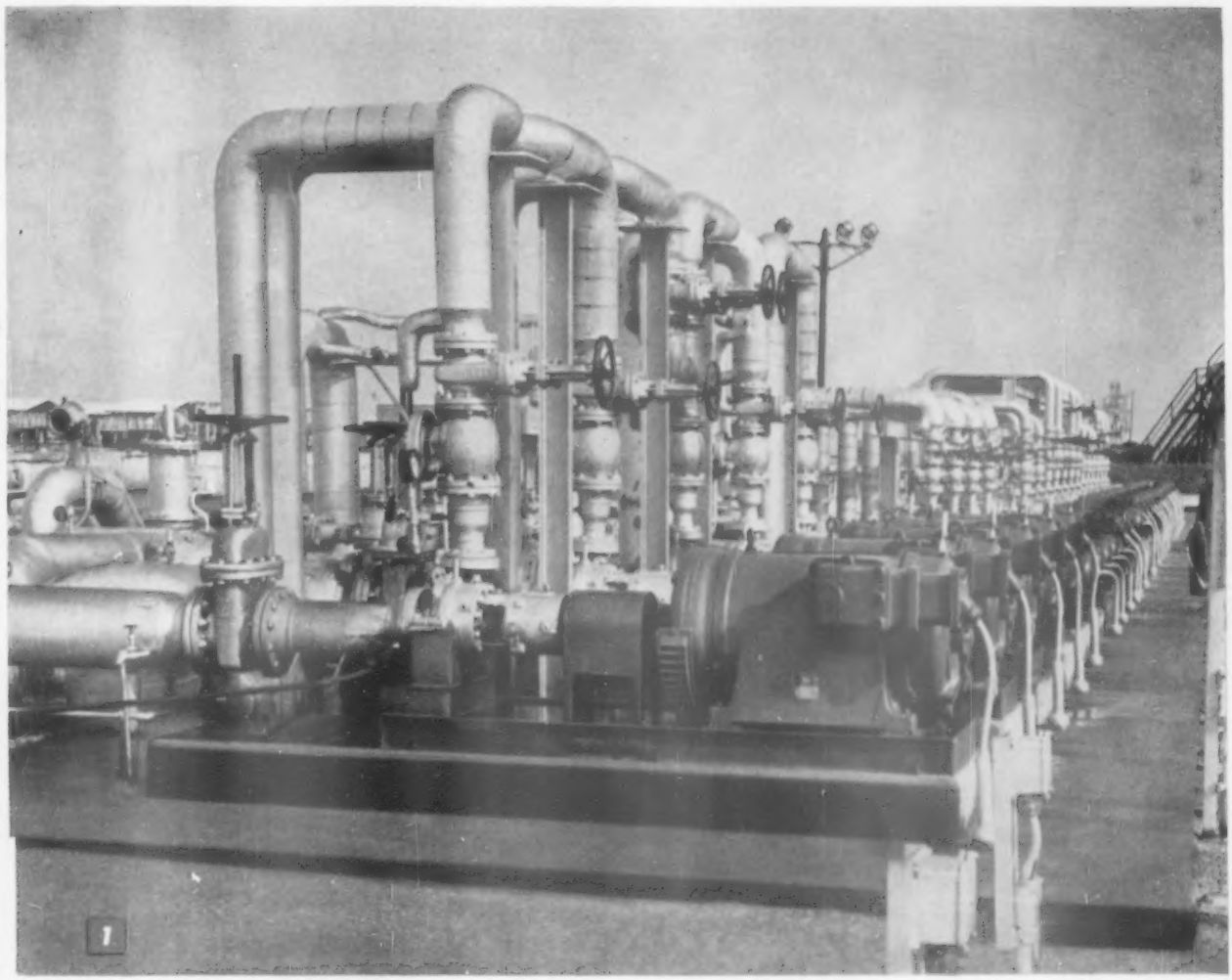












. . . plus I-R Cat Cracking Blowers and Compressors for dependable plant and process air

1. Line-up of 27 Ingersoll-Rand centrifugal process pumps at the loading plant of Esso's Antwerp, Belgium, refinery.
2. Three I-R Turbo-Blowers serving the Model IV cat cracking unit. The two large blowers handle air and gas respectively and the small, single-stage unit in the center provides control air for the regenerating process.
3. Electric motor-driven Ingersoll-Rand Class XLE compressor supplying plant air. A similar compressor is turbine-driven.
4. An I-R two-stage, heavy-duty process pump at Antwerp.
5. An Ingersoll-Rand 20-stage vertical process pump, Class VHTB, handling heavy naptha for the charging furnace.
6. Two I-R vertical process pumps, Class VP, handling kerosene in the SO_2 plant.

HERE AT Belgium's newest petroleum processing plant, *economy* is the keynote. A new, simplified processing technique, perfected by Standard Oil Development Company, has cut overall refinery cost at least 20%. And the resulting savings in operating and upkeep costs make this one of the most economical plants ever built. In production since July 1953, the plant processes 25,000 bbl per day of middle Eastern crude, for gasoline, kerosene, diesel oil and light and heavy fuel oils.

The Ingersoll-Rand equipment shown in the accompanying photographs is another example of the long-range economy of this 225-acre plant. For I-R pumps, blowers and compressors are known the world over for efficient performance and *lasting dependability*. Your I-R representative or branch office will be glad to give you complete information on any of this equipment.

Ingersoll-Rand

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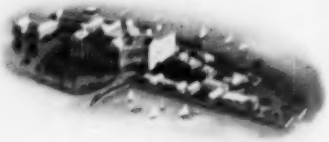

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The Princess

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BARRANQUILLA, COLOMBIA
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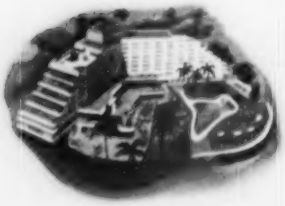

CARACAS, VENEZUELA
Hotel Tamanaco

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Spare that Camel!

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J&L STEEL

Carefully calculated combination strings add to the factor of safety with which casing can be set at great depths and pressures.

Other safeguards are automatically invoked when you specify A.P.I. seamless made by J&L.

A.P.I. standards can go only so far . . . can set up only important but easily attainable minimum requirements. They cannot specify, for instance, that every step from mine through finishing process be controlled by an organization that has made things of iron and steel for more than 100 years.

Where so much is at stake and the situation so critical as in setting a string of casing, a little thing can save the camel's back . . . a little thing like JONES & LAUGHLIN SEAMLESS rolled in or stenciled on pipe.

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

R/M SUPER-POWER V-BELTS...

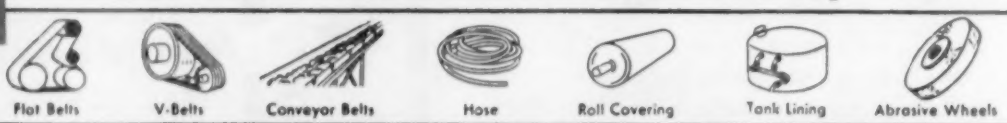
Today's bigger rigs, higher rig floors and heavier power loads demand greater strength and more power delivery than ever in V-belt drives. R/M Super-Power V-Belts have that extra strength and power. With R/M Super-Power V-Belts you get 40% greater horsepower capacity than with regular V-belts. A combination of new synthetic fibers in the V-belt strength member provides greater resistance to heavy shock loads . . . virtually eliminates belt stretch and matching problems. R/M Super-Power construction, plus straight side-walls, means better belt tensioning and grip, less slip . . . more power delivered on the drive—*extra* power for your drilling and pumping operations. In addition, R/M Super-Power V-Belts are oil-proof, non-spark and heat resistant.

These features add up to "MORE USE PER DOLLAR" when you specify R/M Super-Power V-Belts for your drilling rigs and pumping units. Write for a copy of Bulletin 6628. And inquire also about other R/M V-Belt constructions, flat belts and rubber hose specially engineered by Manhattan for use in the oil field.

RM

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
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Four companies agree on one transmitter location...one antenna tower...AND G-E!

2-WAY MOBILE RADIO

FREQUENCY STABILITY & SELECTIVITY
guaranteed for life!

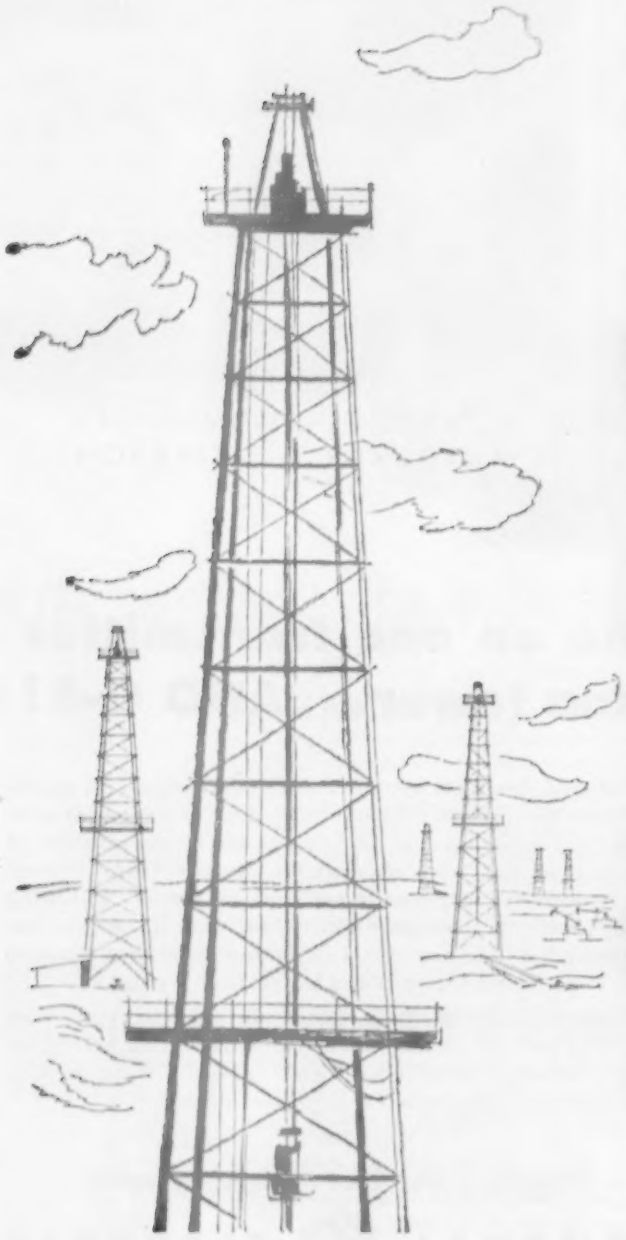
At Houma, Louisiana, you'll find one of the most unique mobile radio installations in existence. Four major companies combined their communication interests to effect great economy of operation yet yield high efficiency for all users. *Under one roof,* four separate G-E 250-watt transmitters are housed. Following through with this community plan . . . *one tower* is common support to each of four antennas. In operation more than a year to date . . . no interference problem has yet been reported!

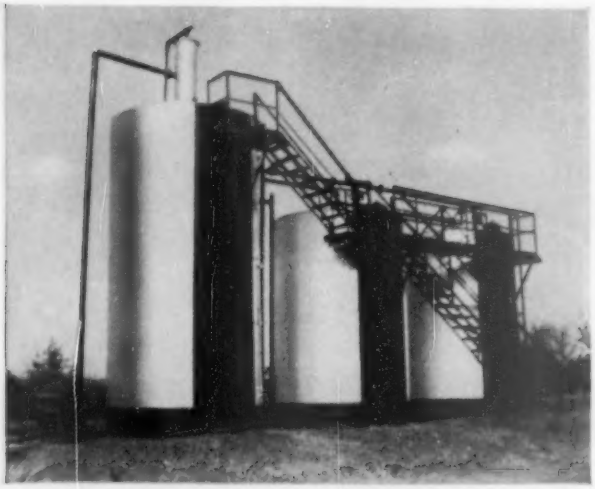
The system described here typifies what you can expect from G-E. Why not call on this expert radio engineering know-how for your communication requirements? *General Electric Company, Section X8114-8, Electronics Park, Syracuse, New York.*

Progress Is Our Most Important Product

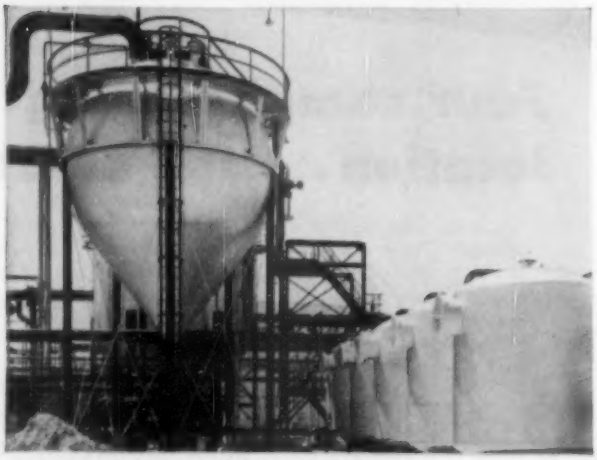
GENERAL ELECTRIC

GRAVER Serves the Petroleum from well-head





From nine strategically located cities GRAVER SUPPLY COMPANY sells Graver-fabricated lease tanks, walkways, oil and gas separators, heaters, and other well-head equipment.



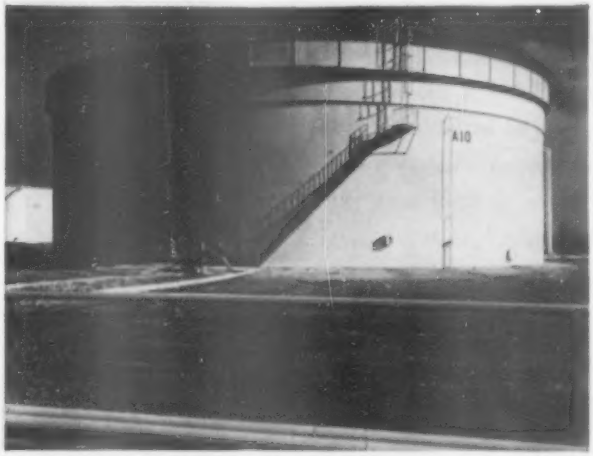
The Graver Sphericone Hot Process Softener, with or without hot zeolite after treatment, produces a safe boiler feedwater. GRAVER WATER CONDITIONING COMPANY also supplies standard hot process units and hot zeolite systems which can be added to existing hot process units.

Industry

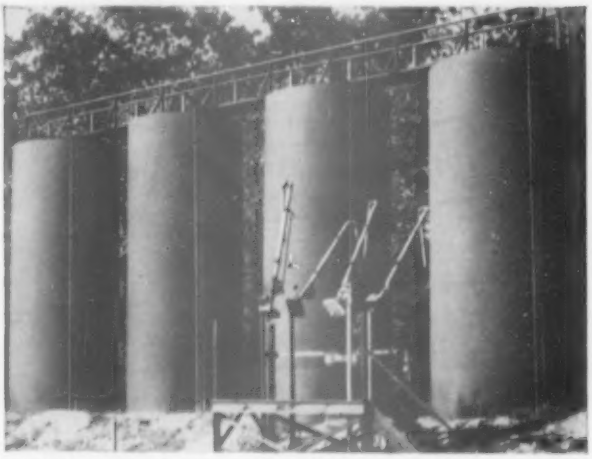
to market

GRAVER CONSTRUCTION COMPANY designs, engineers, builds and maintains pipeline stations, refineries and other petroleum installations. *Guaranteed* customer satisfaction is a part of every Graver job.

GRAVER'S unequaled fabricating skill in steel and alloys is seen in the many towers and intricate process vessels constructed for the country's leading petroleum companies.



The GRAVER EXPANSION ROOF TANK represents the ultimate in modern conservation equipment. It is but one of Graver's many "tailor-made" designs that helps conserve petroleum products.



GRAVER vertical, horizontal and underground tanks are available in capacities from 550 to 30,000 gallons. They supply the market needs of the industry coast to coast.

GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

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GRAVER

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THE NAME BEHIND THE PRODUCT

LE GRAND Stuffing Boxes have been in use in most of the World's Oilfields outside the U.S.A. They are manufactured as either Regular or Shut-off types incorporating an integral flexible joint if desired, and made to take 1¼", 1½", 1¾" and 1.66" diameter polished rods or tubes. The method of operation of the Shut-off Box is the simplest and fastest available, it allows the Stuffing Box packing to be changed without having to wait for the well to stop flowing, thereby avoiding waste of oil, and shuts off or releases with the minimum of delay without leaks. Our Illustrated Brochure giving full details of these Stuffing Boxes will be gladly forwarded on request.

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PETROLEUM CHEMICALS DIVISION

NEWS

November ★ One of a Series of Interest to the Petroleum Industry ★ 1954

Du Pont announces

NEW TYPE LUBE OIL ADDITIVES to solve low-duty sludge problems

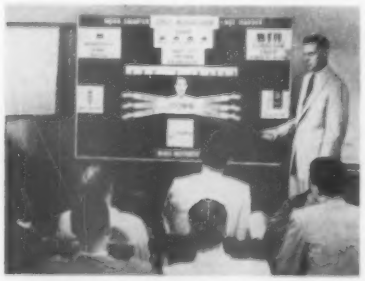
New Du Pont Lube Oil Additive 564 and Lube Oil Additive 565 are both polymeric additives. Both are outstanding detergents and viscosity index improvers. They are exceptionally effective in retarding sludge formation under stop-and-go driving conditions.

Different molecular weights distinguish the two additives. Now available in commercial quantities, they can be used in extremely low concentrations with substantial dollar savings over the use of conventional additives.

NEW "SHOW" HAS MILLION-DOLLAR PLOT

Here's a "show" that will never hit Broadway . . . but you won't want to miss it.

It's the Du Pont Cost Reduction Show. It's based on a systematized method of reducing costs which our company has developed over many years of manufacturing experience. Since it has proved so effective in our own plants—resulting in savings running into millions of dollars—we thought some of our friends in the oil industry would like to have us review it for them.



THIS FLANNELBOARD DISPLAY is part of the 40-minute Du Pont Cost Reduction Show.

Dramatic presentation

To get over the key points quickly and dramatically, we have organized the story into a three-part presentation . . . including a flannelboard talk, a motion picture, and a slide presentation.

Du Pont's program is certainly no magic formula that works miracles. It is, however, unique with respect to its formalized organization, and the high degree of employee participation it has accomplished. The key to its success is the development of a cost-conscious attitude in the minds of *all* employees.

Work smarter . . . not harder

The Cost Reduction Show describes how work simplification training and a suggestion plan are integrated into the program. The functions and value of a full-time co-ordinator, and his role as an aid to line organization are discussed in detail. Emphasis is placed on promotion of the program to a point where cost reduction becomes a *work habit* . . . and helps to improve human relations as well as efficiency.

A number of Du Pont men in various parts of the country are now being trained to put on the show for the oil industry. Showings are limited to oil company offices and refineries. For more details about the Cost Reduction Show, we suggest you get in touch with one of the Du Pont Petroleum Chemicals Division regional offices.

"Looking through the windshield"

Looking at each other through the windshield is where dealers and motorists first meet. Du Pont can help your dealers get better acquainted with customers through a series of clever little folders called "Looking through the windshield."

What the motorist sees through his windshield when he stops for gasoline spells the difference between a successful service station . . . and a business that is just getting by. This fact is mighty important to every one of your dealers. But how many of them use it to their own advantage?

THIS CUSTOMER'S EYE-VIEW can spell the difference between success or failure for a service station business. A new series of Du Pont folders can help your dealers give their customers a "better" view.

The chances are that if your dealers could get a better understanding of their customers, they would, in turn, be better prepared to give these customers a favorable impression of the service station. Here's how the Du Pont Petroleum Chemicals Division can help you with

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *"The Windshield"*

this important project.

"Looking through the windshield" is the theme of a new series of folders for your dealers. Each of the folders in the series discusses a specific phase of service station business . . . (1) the customer himself, (2) "regular" and "premium" purchases, (3) use of credit cards, (4-5) oil and TBA buying habits, and (6) free dealer services.

Each is a 4-page folder with an intriguing *cutout* "windshield" looking through the front cover into the inside of the folder at the dealer. The folders achieve an interesting three-dimensional effect as a result of this unusual art treatment.

They are based on information uncovered by Du Pont's recent extensive survey of consumer gasoline buying habits. But they explain each point in simple, straightforward language that can be readily understood and easily remembered by any dealer or service station attendant.

"A close look at the man behind the wheel" is the title of the first in the series. What your dealers know about this "man behind the wheel"—can have an important bearing on sales and profits . . . for both you and your dealers.

The average motorist, for example, is loyal to one station—and buys at least 75% of his gasoline there. The folder points out, therefore, that the more a

THE "WINDSHIELD" THEME is effectively dramatized in each folder by a die-cut through the cover page—which shows the dealer looking out from an inside page.

dealer can do to increase customer *loyalty*, the better his business will be. But *how* can he do this? . . .

If the customer is under 35, the chances are that *friendship* is the basic ingredient in his loyalty. Motorists over 35, on the other hand, tend to base their loyalty more on the kind of *service* they receive.

Although subtle, these are important points for every dealer to know and understand. And this new folder helps him to understand them in terms of his own cash register.

Quantities of "A close look at the man behind the wheel," the first in this series are now available for distribution to your dealers. Any Du Pont Petroleum Chemicals Division representative or regional office will be glad to give you sample copies . . . and cost information for ordering them in large quantities.

"MAGIC BARREL" ON EUROPEAN TOUR

On October 4, two representatives of the Petroleum Chemicals Division, R. Carter W. Jones and Roberts W. Brokaw, took off for Europe—each with a "Magic Barrel."

They are taking part in a 6-week European tour sponsored by the National Sales Executives, Inc. Its aim is to acquaint European businessmen with American methods of selling. The "Magic Barrel" was picked to be included in the tour as an example of a unique and interesting method of selling an industry to the general public.

When the tour is concluded in Paris on November 13, the "Magic Barrel" will have been seen by audiences in 27 major cities of 20 European countries.

In addition to the Du Pont men, the Sales Executives group includes representatives from 10 other American companies.

New Phase of Antiknock Research Discussed in Paper

Engines are now being operated on hydrogen and carbon monoxide at the Du Pont Petroleum Laboratory. The operation is part of the Laboratory's extensive antiknock research program.

This work was recently discussed in a paper presented at the west coast meeting of the Society of Automotive Engineers by Dr. B. M. Sturgis, who co-ordinated the project at the Petroleum Laboratory.

The paper, one of the most comprehensive on knock and antiknock action to be presented since the end of World War II, brings out several significant findings. For example, the Du Pont experiments helped to determine what similarities exist between hydrogen combustion and hydrocarbon combustion. And experiments with carbon monoxide showed that water vapor, which could not be eliminated from the fuel-air mixture, entered into the combustion process to produce knock.

This lends further support to the theory that knock reaction may be related to the presence of simple hydrogen and oxygen containing radicals . . . and that tetraethyl lead inhibits knock by suppressing the action of these radicals.

A copy of the paper can be easily obtained from any of the Petroleum Chemicals Division regional offices listed below.

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IN CANADA: Du Pont Company of Canada Limited—Petroleum Chemicals Division, 80 Richmond Street West, Toronto 1, Ontario
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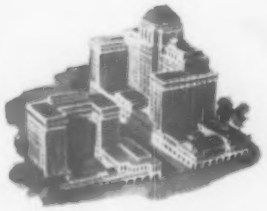
ATLANTIC CITY



Chalfonte-Haddon Hall

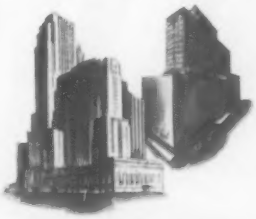
BALTIMORE

Lord Baltimore

CHICAGO

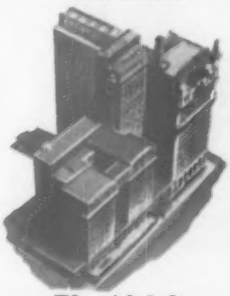
The Drake

CINCINNATI



Netherland Plaza & Terrace Plaza

DALLAS



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Hotel Commodore

PITTSBURGH

Carlton House

ST. LOUIS

Chase & Park Plaza

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We invite you to examine and compare the threads and make-up of the Jones Joint. We know you will agree that, today, these rods and couplings are the strongest and finest in any field. Why accept less than the best?

PESA

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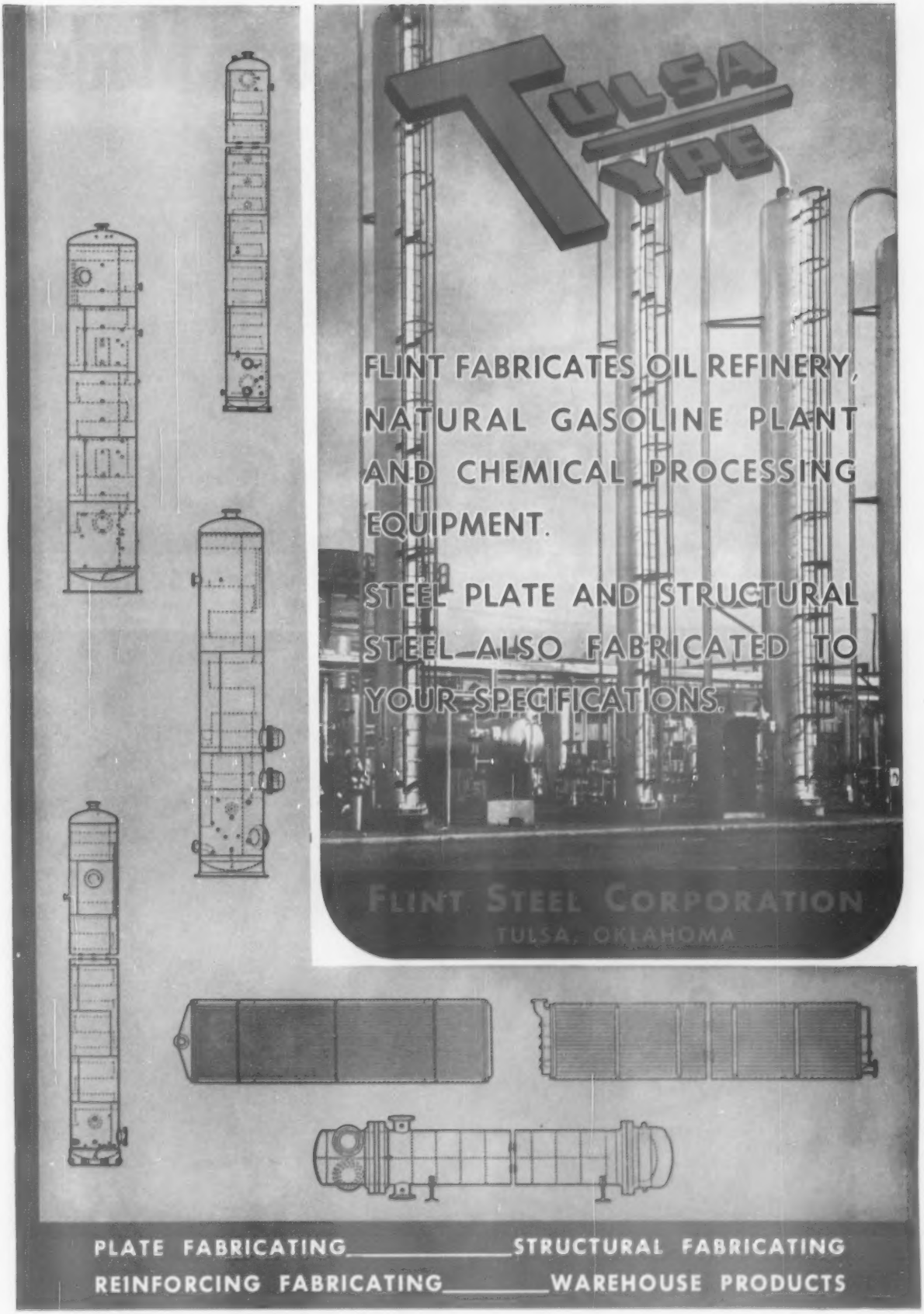
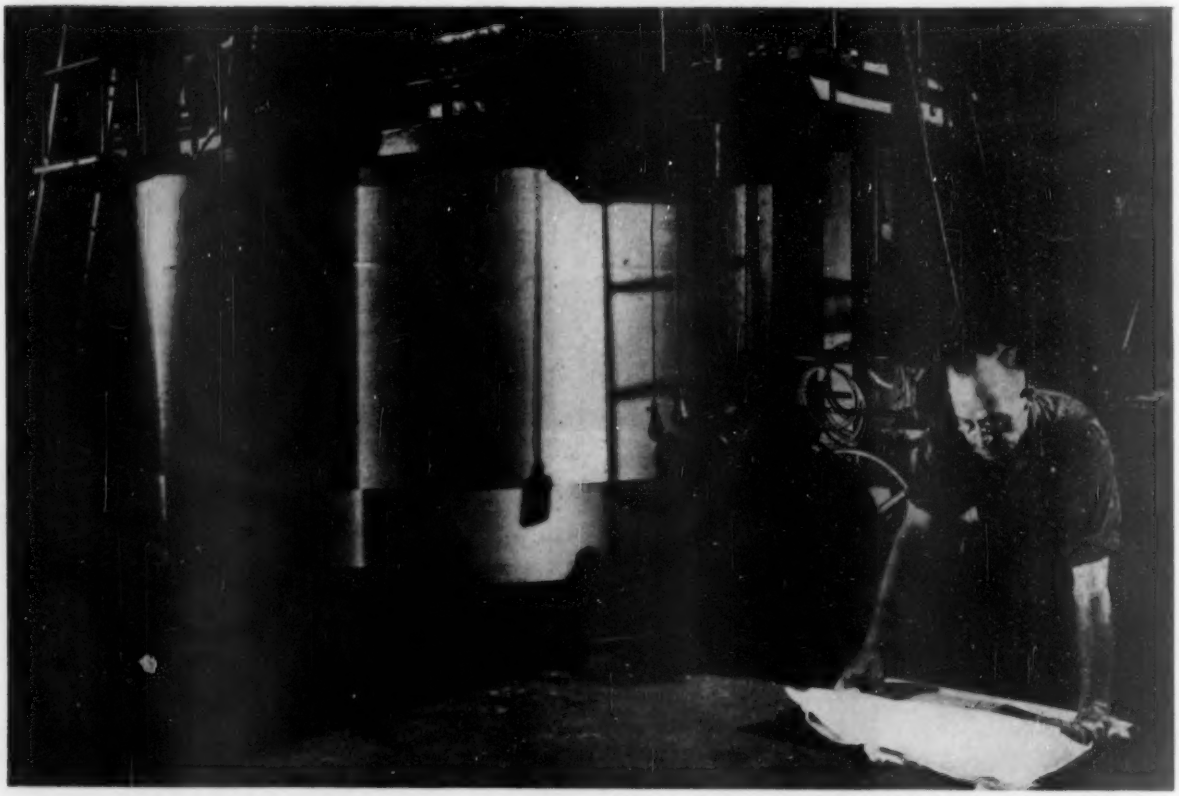
50 Church Street, N. Y. C.

LOOK FOR THE GREEN RODS


TULSA TYPE
FLINT FABRICATES OIL REFINERY, NATURAL GASOLINE PLANT AND CHEMICAL PROCESSING EQUIPMENT.
STEEL PLATE AND STRUCTURAL STEEL ALSO FABRICATED TO YOUR SPECIFICATIONS.
FLINT STEEL CORPORATION
TULSA, OKLAHOMA
PLATE FABRICATING
STRUCTURAL FABRICATING
REINFORCING FABRICATING
WAREHOUSE PRODUCTS

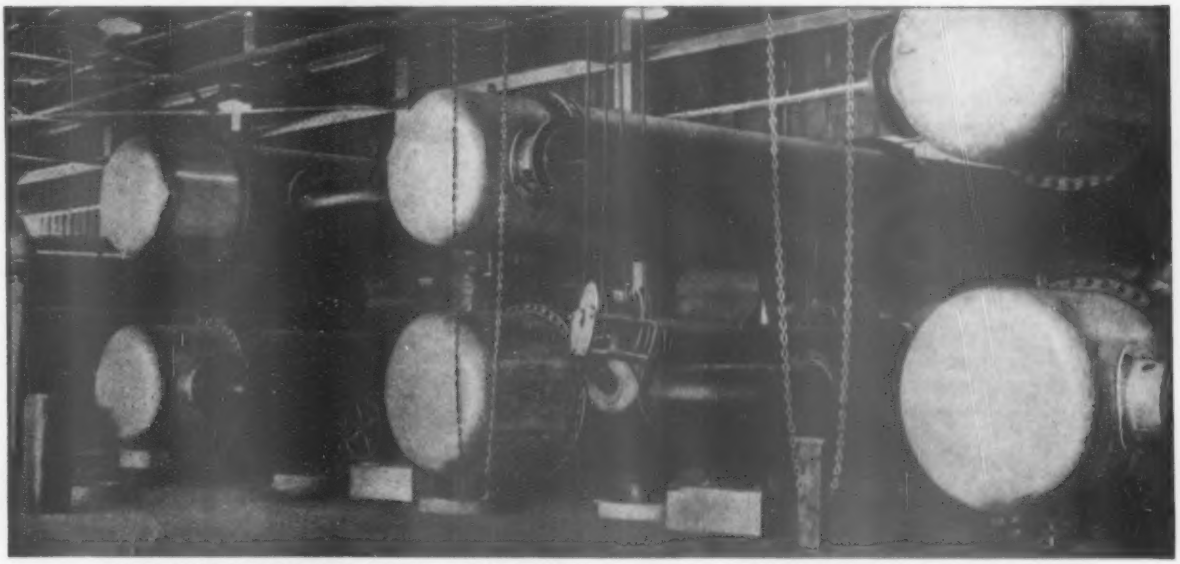
Profit-building answers to Modern

...examples of the wide variety of heavy-metal equipment designed and built by Alco to meet today's demands in petroleum and petrochemical processing . . . results of **Alco Experience** . . . gained through many years of designing and building heavy-metal equipment for refining and processing companies the world over . . . and **Alco Facilities** . . . capable of handling economically an extremely wide range of metal-fabricating operations . . . of meeting strictest customer specifications.

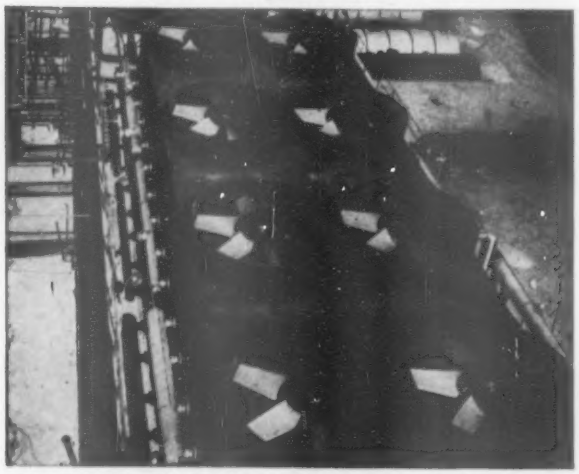


LARGE-DIAMETER BORING MILL, equipped with two rail heads and capable of handling work 25 ft 0 in. high, is typical of the complete, modern production facilities in Alco's shops which can produce virtually every type of heavy-metal equipment for the petroleum, chemical and power industries.

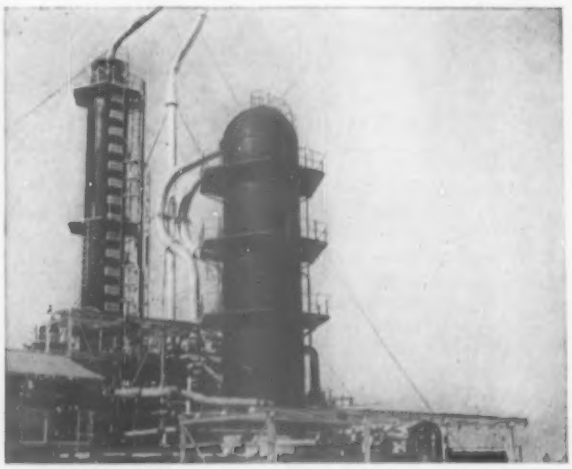
Processing problems



HEAT EXCHANGERS, built by Montreal Locomotive Works, Ltd., an Alco affiliate, ready for final piping in the Edmonton plant of The Canadian Chemical Company, Limited. Heads, tubes and tube sheets of these exchangers are fabricated of Type 316 stainless steel. MLW has supplied more than 200 heat exchangers and reboilers for this gigantic new installation.



AIR-COOLED HEAT EXCHANGERS were supplied by Alco for Celanese Corp. of America's new Pampa, Texas, plant. Mounted in 17- by 24-ft induced-draft housings, each cooling bank is equipped with two Monel fans supported on silicon rubber. Total heat dissipation from this specially engineered installation is 229,400,000 Btu per hr, a record for air-cooled condensers.



WORLD-WIDE USE of Alco equipment is typified by the wide range of Alco coolers, exchangers, condensers and heaters in service at the Aquila refinery in Trieste, Italy. Operating on Middle Eastern crudes, Aquila's annual capacity is over 900,000 tons with products including high-octane gasoline, top-quality lubricating oils and several types of asphalts and paraffin waxes.

You can find your own profit-building answers by using Alco facilities and experience on your processing problems. Contact your nearest Alco Products sales representative today. Offices in Dunkirk, New York, Chicago, Los Angeles, Kansas City, Houston, Tulsa and Beaumont.

ALCO
PRODUCTS

AMERICAN LOCOMOTIVE COMPANY
Sales and Service Offices in Principal Cities

SERVICE...
plus EQUIPMENT you can depend on

Check this list of our suppliers. All of them are big names in the oil industry. We have bought from many of them for 25 years or more because *we are sure of their quality products and have confidence in their generous guarantees.*

For SERVICE plus EQUIPMENT you can depend on, see IVERSON SUPPLY for all your Drilling, Production and Refinery Equipment.

A PARTIAL LIST OF OUR SUPPLIERS

- Alten Ideco Pumping Units
- American Iron and Machine Works Co.
- Baash-Ross Tool Company
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IVERSON SUPPLY CO. OIL WELL SUPPLIES

STORES: Artesia and Farmington, New Mexico; Ada, Oklahoma City, Okmulgee and Tulsa, Okla.; Kermit, Odessa and Snyder, Texas; and Price, Utah.

OFFICES: FORT WORTH, TEXAS

IVERSON SUPPLY COMPANY

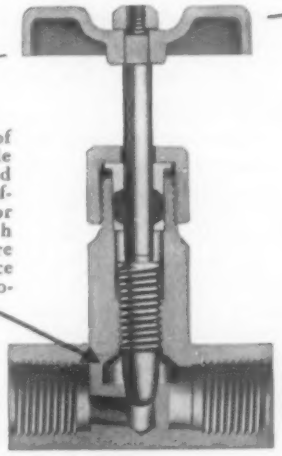
DRILLING-PRODUCTION AND REFINERY EQUIPMENT

P.O. BOX 1439 — TULSA 1, OKLA.

OFFICES: DALLAS, MIDLAND

MAXIMUM WORKING PRESSURE
10,000 PSI
for water, oil or gas

- Body and stem guide extra heavy bar stock fused into one piece.
- Valve stem 416 stainless steel.
- Packing special one-piece "Marpak" moulded ring.
- Bodies marked in accordance with MSS regulations.



ONE PIECE

The stem guides of conventional needle valves are screwed into bodies—this often causes leakage or blow-outs. Marsh Needle Valves are fused into one-piece by exclusive "Conoweld" process.

Introducing-

The Ultimate in Needle Valves

Here is one of the crowning achievements of Marsh research, design, and manufacturing skill. It is the first needle throttling and shutoff valve to combine *all* of the qualities called for today in this highly critical and ever broadening field.

It is a valve that has strength and safety to spare . . . rated for pressures up to 10,000 psi—equally efficient in the lower ranges. A product of Marsh instrument-making and valve manufacturing experience, it combines instrument-like precision with the ruggedness that distinguishes all Marsh valve specialties.

The illustrations tell the story of new thinking; new standards. Body and stem-guide are machined from extra-heavy carbon steel bar stock. Still greater strength and rigidity are achieved by fusing the stem-guide into the body. The complete fusion of guide and body is accomplished by the exclusive Marsh "Conoweld" process.

There are two big advantages to this one-piece construction: (1) It eliminates the danger of unscrewing the valve from the body when opening—a frequent cause of leakage, even dangerous blow-outs (2) It permits perfect line-up of threads and seat. As a result, Marsh valves are easier to operate even at high pressures.

The precision-machined stem is 416 stainless steel. Stem threads are fine pitch for extra strength and fine, controlled regulation. Notable advancements are special "Marpak" one-piece, non-binding longer-lasting packing; deep thread chambers, keeping inlet and outlet piping away from ports and contributing excellent flow characteristics. Entire packing nut and packing gland are electro-zinc plated, preventing corrosion and giving the valve a handsome, plated exterior. The rugged malleable handle is finished in heavy baked enamel.

The new needle valve line includes globe and angle patterns with double female connections in sizes ⅛", ¼", ⅜", ½", ¾" and 1". Also globe and angle valves with male inlet and female outlet in sizes ¼" and ½". *Complete stock carried at our Skokie, Illinois factory and also at our branch plant in Houston, Texas.*

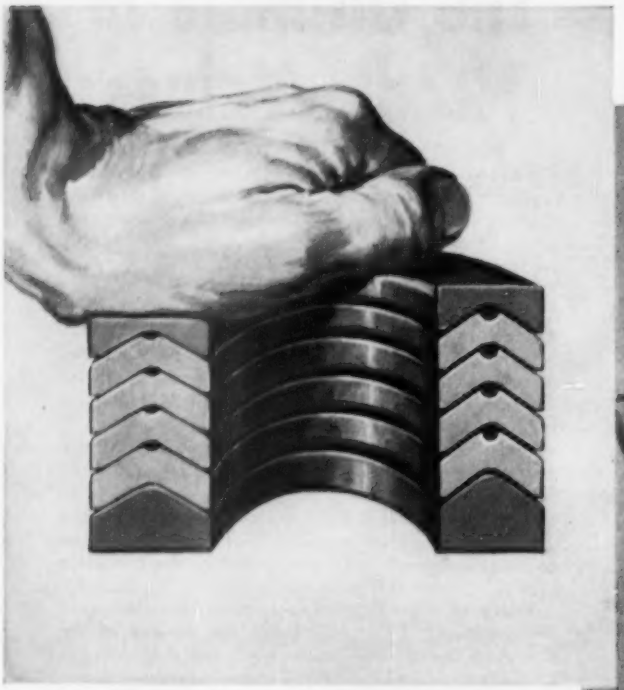
Write today for catalog giving complete details.

MARSH INSTRUMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*
Dept. L, Skokie, Ill.
Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Texas

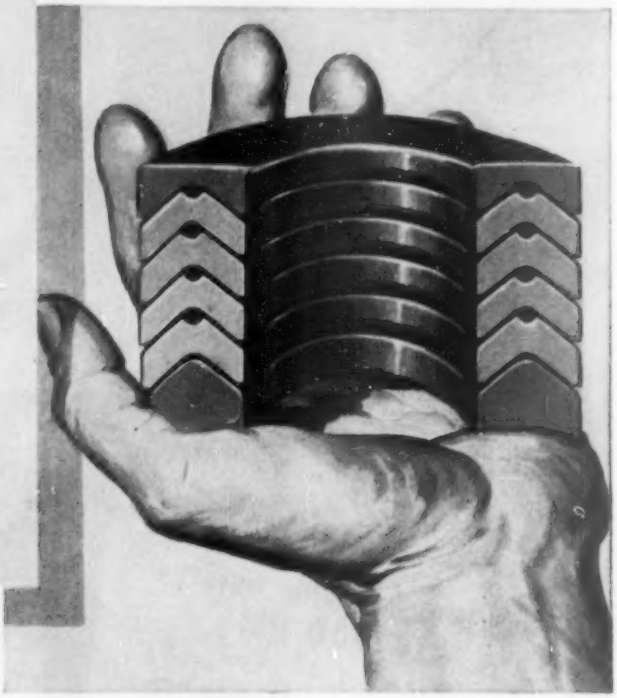
MARSH

"THE STANDARD OF ACCURACY"

See for yourself how U. S. Matchless Packing reduces wear on rods, reduces packing costs



This demonstration set of U. S. Matchless has been cut in half. When set is squeezed by hand, note how the lips spread out. Then note what happens when the pressure is released...



When pressure is released, the lips retract. This action duplicates what happens when U. S. Matchless is subjected to hydraulic pressure *plus* subsequent release, as on a reciprocating rod or hydraulic ram.

The photos above show how pressure (whether gas or fluid) forces the double pliant lips of U. S. Matchless® Packing against the rod and side of the stuffing box. *This self-adjusting, automatic action plus the blunt edge design reduces wear on the rods, prolongs packing life and hence lowers maintenance costs.*

U. S. Matchless is recommended as original equipment by some of the largest makers of hydraulic presses and makers of rotary oil drilling rigs. It is ideal for rams, accumulators, triplex pumps and oil well swivels. It is designed to handle hot and cold water, brine and ammonia, hot and cold oils, crudes, gasoline and all petroleum products, and is a favorite of manufacturers of liquid or gaseous materials.

U. S. Matchless Packings are obtainable through any of our selected distributors or any of our twenty-seven District Sales Offices, or by writing the address below.

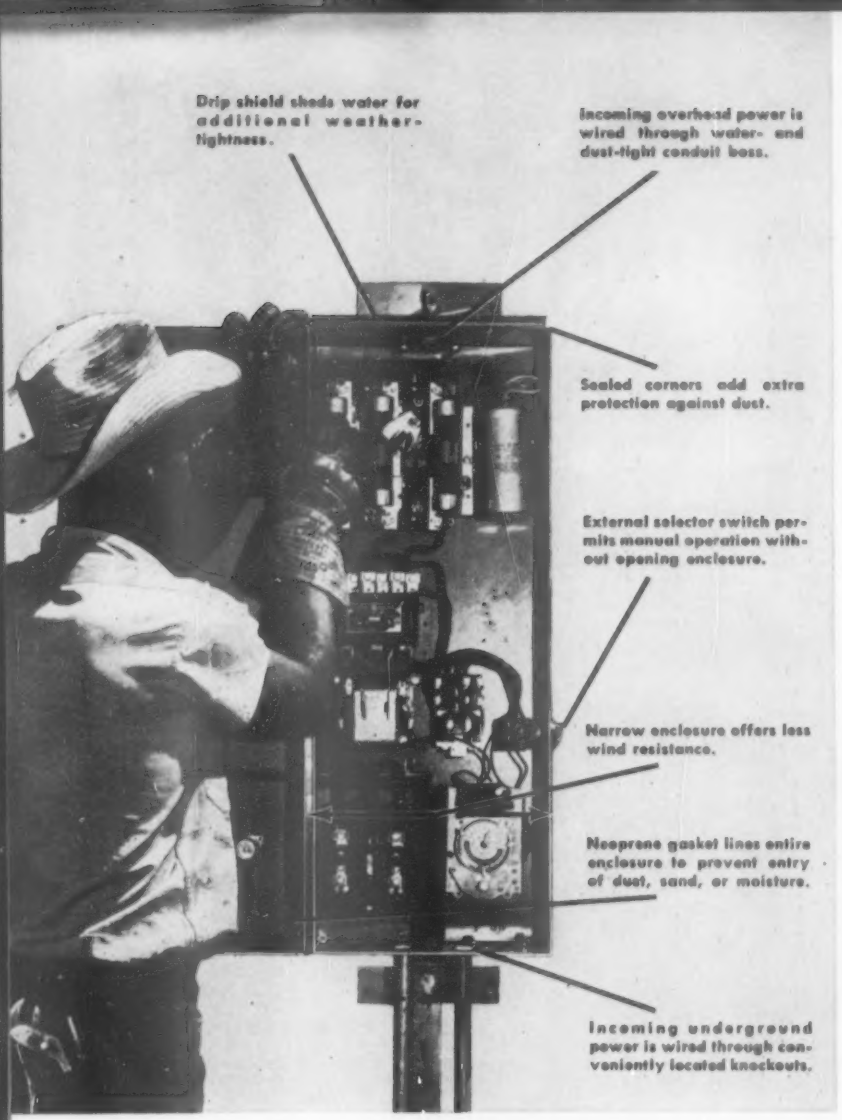
"U. S." Research perfects it.
"U. S." Production builds it.
U. S. Industry depends on it.

US RUBBER

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting


Drip shield sheds water for additional weather-tightness.
Incoming overhead power is wired through water- and dust-tight conduit boss.
Sealed corners add extra protection against dust.
External selector switch permits manual operation without opening enclosure.
Narrow enclosure offers less wind resistance.
Neoprene gasket lines entire enclosure to prevent entry of dust, sand, or moisture.
Incoming underground power is wired through conveniently located knockouts.

BETTER OPERATOR PROTECTION provided by external dust-tight selector switch for manual use in event of non-cyclical pumping. Complete grounding also protects the operator.

SIMPLIFIED WIRING to the pump motor is achieved by availability of two knockouts at bottom of ventilated relay compartment. Too, there is plenty wiring space for incoming power.

JUST WHAT OIL-FIELD OPERATORS NEED . . .

NEW G-E OIL-WELL PUMPING STARTER

More Protection • Versatile Design • Dependable Operation

The new General Electric oil-well pumping starter was designed according to oil industry specifications. Oil-field operators asked for maximum protection against breakdowns and ease of mounting, wiring, and operation. This new starter meets these requirements.

PROTECTIVE FEATURES are headed by a neoprene gasket which lines the door of the enclosure. It helps keep dust and sand from coating contacts and other sensitive parts, assuring dependable control of pumping cycles.

The combination of gasketed enclosure and a separate, ventilated relay compartment is a G-E exclusive. It helps prevent bi-metallic overload relays from tripping prematurely due to heat from the sun.

HIGHLY VERSATILE for both mounting and wiring, the new starter is designed to fit any pole mounting. It is equipped with mounting plates for key- or U-bolt attachment. Its narrow design also has less wind resistance, minimizing storm damage.

With watertight conduit boss at the top and knockouts at the bottom of its case, the starter is easily wired for overhead or underground incoming power.

COMPLETELY GROUNDED by its own lightning arrester and ground, the starter also has a grounding provision for a power-factor correction capacitor. To ground the capacitor, merely mount a stud to the starter enclosure.

FOR MORE INFORMATION contact your nearest G-E Apparatus Sales Office or Distributor, or write to Section 730-57, General Electric, Schenectady 5, N. Y. Ask for bulletin GEA-6153.

GENERAL ELECTRIC

"You see Powell Valves everywhere! And with . . .

. . . good reason! They're famous for dependability. Economical, too.
What's more, Powell has a complete line."

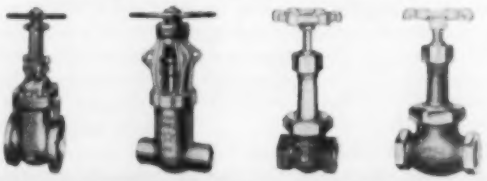
Famous for dependability

SINCE 1846

Wherever flow requires dependable control, there's *the* place for Powell Valves. Powell probably makes more kinds of valves and has solved more valve problems than any other organization in the world.

Available through distributors in principal cities. Made ⅛" to 30" and for 125 pounds to 2500 pounds W.S.P. Bronze, iron, steel and corrosion-resistant metals and alloys. On problems, write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

CONTROLS FOR THE LIFE LINES OF INDUSTRY



Powell Valves 108th year

"RED IRON" ELIMINATES RED INK!
WILSON RIGS are MONEY-MAKING RIGS!
Atlas Rig
Rated Capacity
10,000 feet with 4½"
drill pipe
DON'T BUY
AN OBSOLETE RIG
BE MODERN-BUY WILSON!
First choice with Drilling Contractors . . . Best Friend of the Auditors. Wilson — the FIRST NAME in DRILLING RIGS! The only compound rigs with EIGHT SPEED, ALL-FRICTION DRIVES. Wilson . . . the Power Rig Pioneer . . . is still years ahead of the field.
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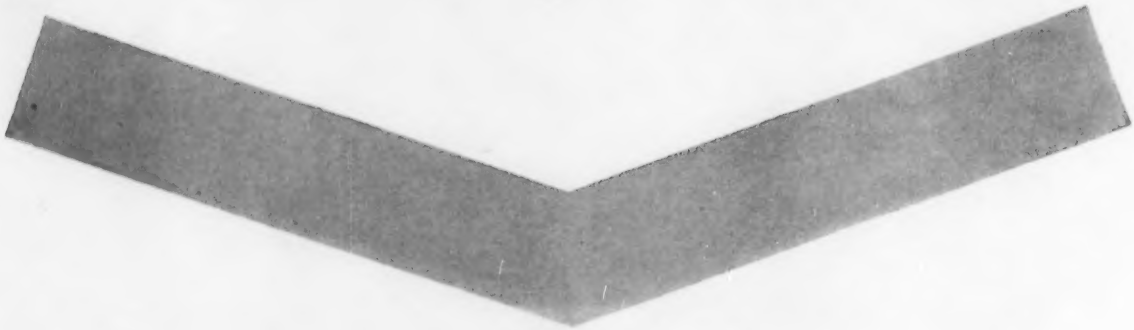
The FIRST NAME in DRILLING RIGS!
WILSON MANUFACTURING CO., Inc.
The HOME of RED Iron • WICHITA FALLS, TEXAS, U.S.A.

Only Brown flow meters offer you these profitable "*plus*" *values*

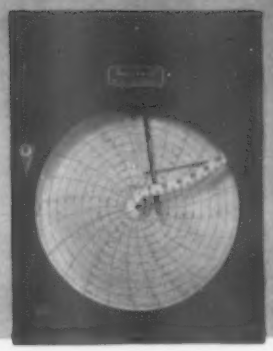


- ***16 different types*** of basic instrument systems . . . a flow meter for every fluid, every pressure, every operating requirement. *You're sure to find the most profitable meter for your specific application.*

- ***Nearby service facilities.*** There's a Honeywell service center as near to you as your phone. Service by factory-trained specialists is prompt, competent and economical. *You're sure to get maintenance and start-up service without delay.*

- ***27 years of experience*** in flow metering development and application work. *You're sure to get specialized engineering on your flow metering problem.*

- ***Nationwide field organization.*** Brown flow metering consultation is available from experts in more than 90 field offices, located near every major production center. *You're sure to have application engineering on hand where and when you need it.*



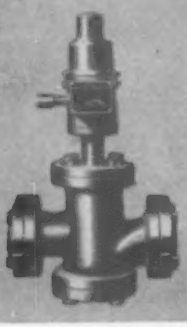
Linear scale meters—mechanical or electrical types, all control forms.

Square root scale meters—mechanical, or electrical or pneumatic transmission . . . all control forms.

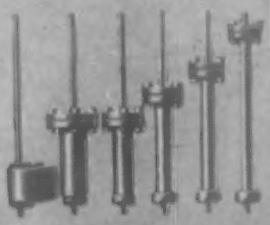
Portable meters—versatility, for spot checks of flow values not continuously recorded.

Low pressure meters—either electrical or mechanical type, for air or gas flow.

Differential Converter—mercury-less pneumatic flow transmitter with infinitely adjustable range.



Area Type Meters for measuring flow of viscous fluids . . . electrical transmission.



Interchangeable range tubes typify rangeability of all Brown flow meters.

NOTE:

Tel-O-Set miniature instruments and *ElectroniK* indicators, recorders and controllers are available for use with all flow transmitters.

a flow meter for every fluid...

every application (all available with electronic integration)

In performance, too, Brown flow meters provide you unsurpassed precision . . . reliability . . . convenience . . . with minimum maintenance requirements. In every way, you'll find it pays to select your flow meters from the one line that offers the most value.

Your nearby Honeywell sales engineer will be glad to discuss your specific flow application . . . and he's as near as your phone.

Minneapolis-Honeywell Regulator Co., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

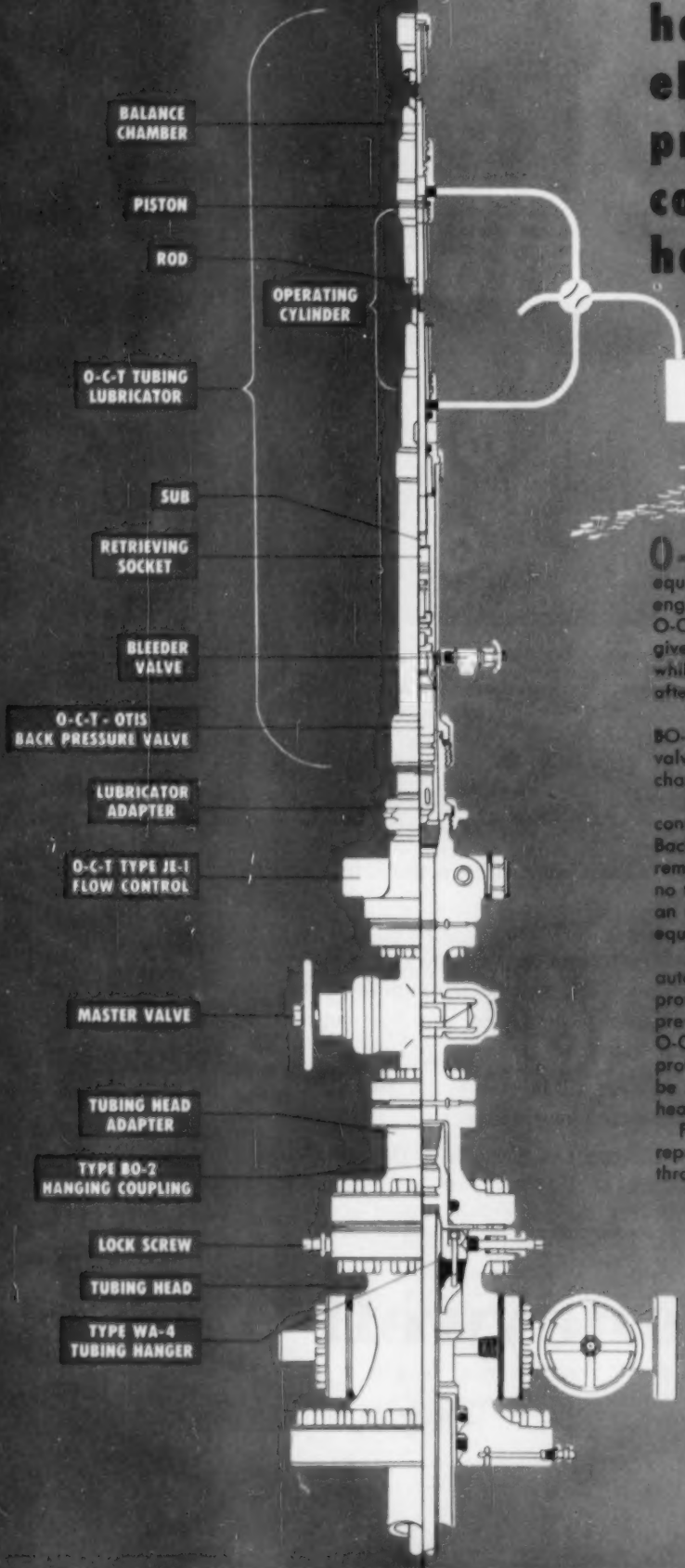
● **REFERENCE DATA:** Write for new Catalog 2328, "Flow Meters, Indicating, Recording, Integrating, Controlling."

MINNEAPOLIS **Honeywell**

BROWN INSTRUMENTS

First in Controls

How O·C·T·OTIS have combined to eliminate high pressure well completion hazards



O-C-T, the leader in high pressure oil field equipment, and Otis have combined their engineering skills to design and manufacture the O-C-T - Otis Back Pressure Valve. This valve gives you complete protection against blowouts while blowout preventers are being removed after tubing has been landed.

The O-C-T - Otis Back Pressure Valve and the BO-2 coupling are also adapted to run and set the valve into the coupling under pressure when changing a Christmas tree master valve.

Designed and built to do the job safely, conveniently and economically, the O-C-T - Otis Back Pressure Valve can be easily installed and removed under pressure, requires no rotation, has no threads to corrode with age, does not require an oversize tree and can be run with either O-C-T equipment or Otis wire line equipment.

The "C-19" Casing Head, the oil industry's first automatic, suspension and sealing hanger unit, provides casing seal and suspension before blowout preventers are removed. Combined with the O-C-T - Otis Back Pressure Valve you get double protection. O-C-T guarantees that the "C-19" can be set and nippled up faster than any other casing head, using the installation procedure you choose.

For details write or see your O-C-T representative. All O-C-T products are available through more than 700 supply stores.

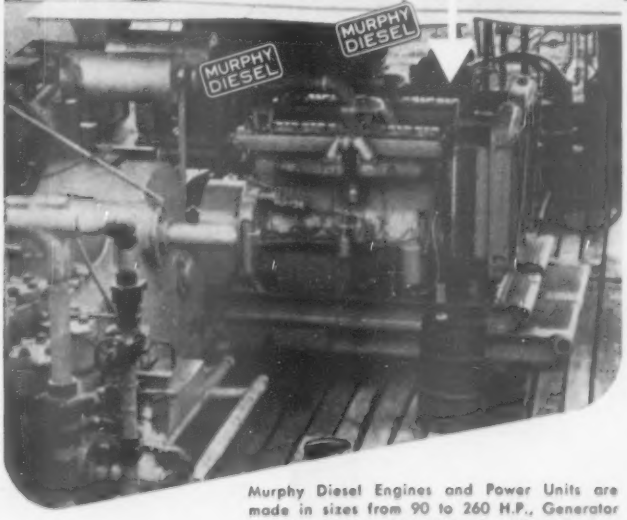
O·C·T

OIL CENTER TOOL CO.

Export Representatives: Sterling Areas — Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

5 MURPHY DIESELS

put real heavy-duty power into this Clegg and Hunt rig



Murphy Diesel Engines and Power Units are made in sizes from 90 to 260 H.P., Generator Sets from 60 to 154 K.W.; Dual-Fuel Engines from 135 to 215 H.P. Marine Propulsion Engines, 90 to 225 H.P.

It's Murphy Diesel power all the way on this rig owned by Clegg and Hunt, Houston, Texas. Three 210 H.P. Murphys power the drawworks and pump. Two 185 H.P. Murphys are also compounded to a pump. When these photos were made, the rig was operating just outside of Beaumont.

Using Murphy Diesel power all the way is the best way to get all the dependable, trouble-free service, freedom from costly downtime, and the fuel economy that make Murphy Diesels so popular in the oil country. All these profit-making advantages are the result of Murphy Diesel's exclusive combination of design features. Ask your Murphy Diesel Dealer to tell you the whole story and to show you how Murphy Diesels on your rig can make it possible for you to make more hole at lower cost.

MURPHY DIESEL COMPANY • 5305 W. Burnham St. • Milwaukee 14, Wisconsin

FACTORY BRANCH—Sales, Parts, and Service: 113-117 So. Elwood St., Tulsa, Oklahoma

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MURPHY DIESEL

SEE YOUR MURPHY DIESEL DEALER, TODAY—

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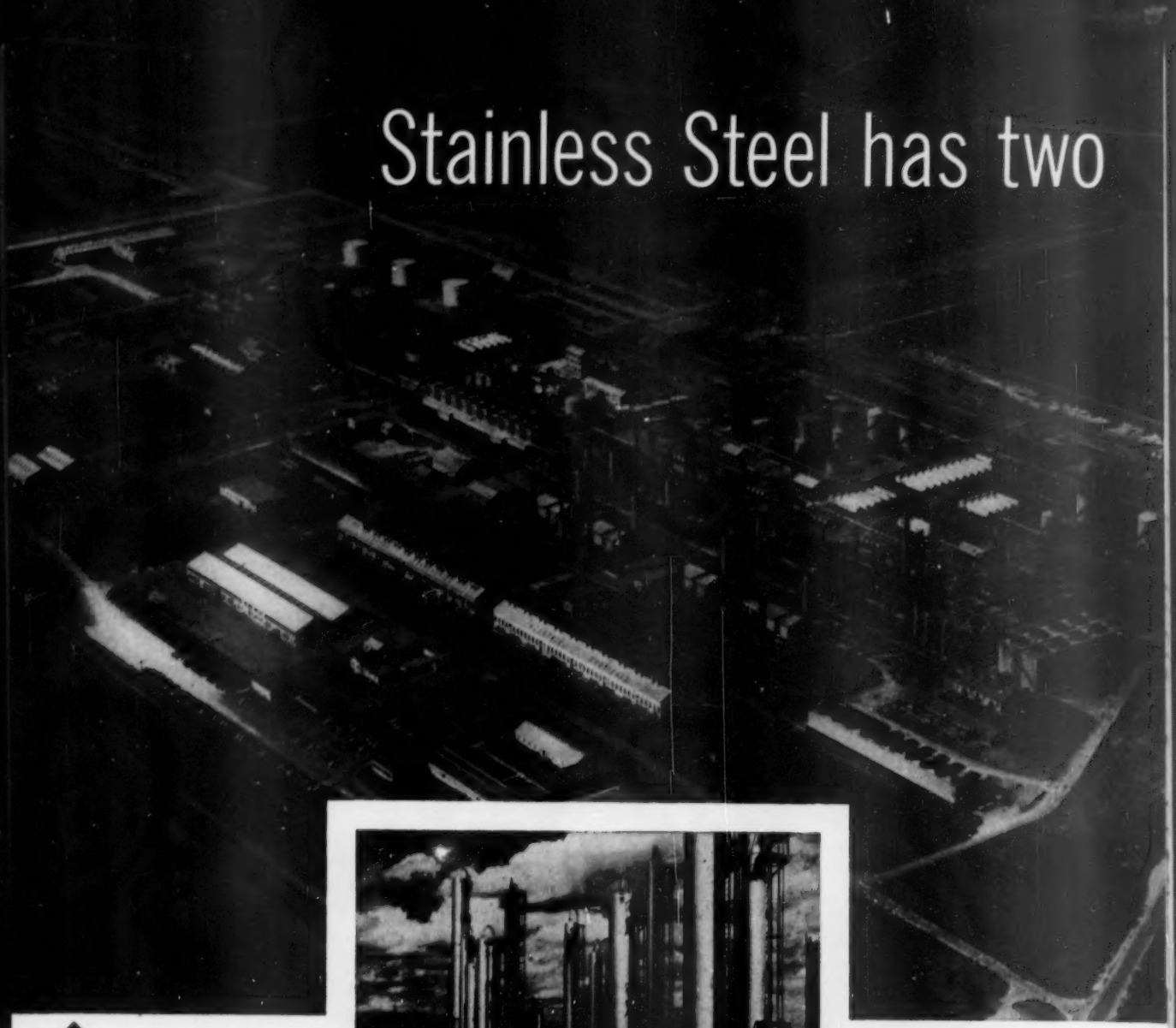
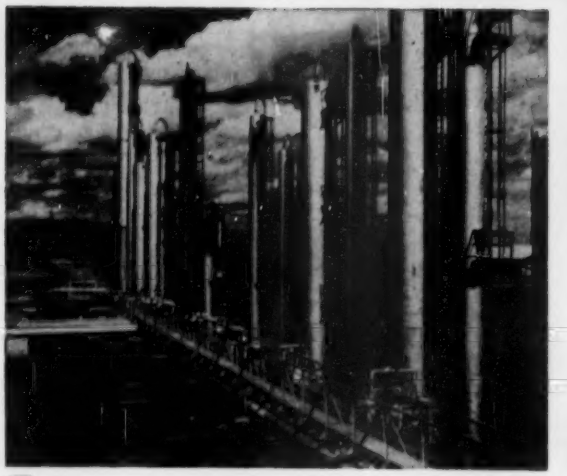
TULSA, OKLAHOMA, SALES, PARTS AND SERVICE.

Stainless Steel has two



▲ Aerial view of Celanese Corporation of America's Chemcel Plant at Bishop, Texas.

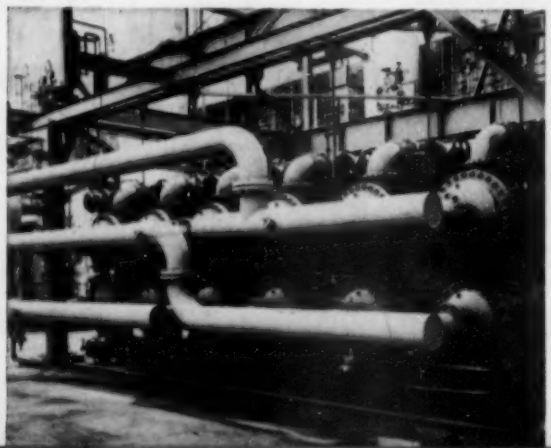
▼ Fractionation tower in the oxidation area is Stainless Steel as are its internals.

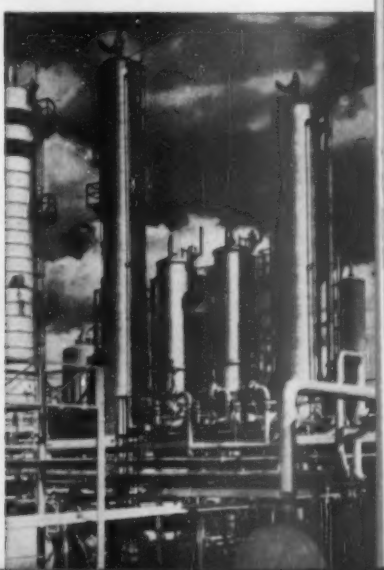


◀ In the acetic acid unit, most towers, tower internals and heat exchangers are Stainless Steel.

▼ Formaldehyde unit at the Chemcel Plant, with towers and internals of Stainless Steel.

▼ Heat exchangers, heads and pipes in oxidation area, also Stainless Steel.





big jobs in this plant

. . . RESISTING CORROSION'S ATTACK

. . . PROTECTING PRODUCT PURITY

THIS is the Chemcel Plant of Celanese Corporation of America at Bishop, Texas. Like so many other plants of its nature, it depends heavily on Stainless Steel to keep its operations continually on stream.

The fractionation tower and its internals, located in the oxidation area, are made of Stainless Steel. So are the heat exchangers, heads and pipes in this same reaction area.

Similar applications of Stainless Steel are located in the secondary oxidation or acetic acid unit and in the formaldehyde unit.

In each case, Stainless Steel is doing a dual job. It is used to withstand the attack of the highly corrosive products being handled, and it safeguards the purity of the chemicals being processed.

Along with these primary advantages of Stainless Steel in petrochemical processing go lower maintenance and replacement costs due to Stainless Steel's durability and long life. It will pay you to put Stainless Steel's benefits to work for you, and when you do be sure it is perfected service-tested USS Stainless Steel.

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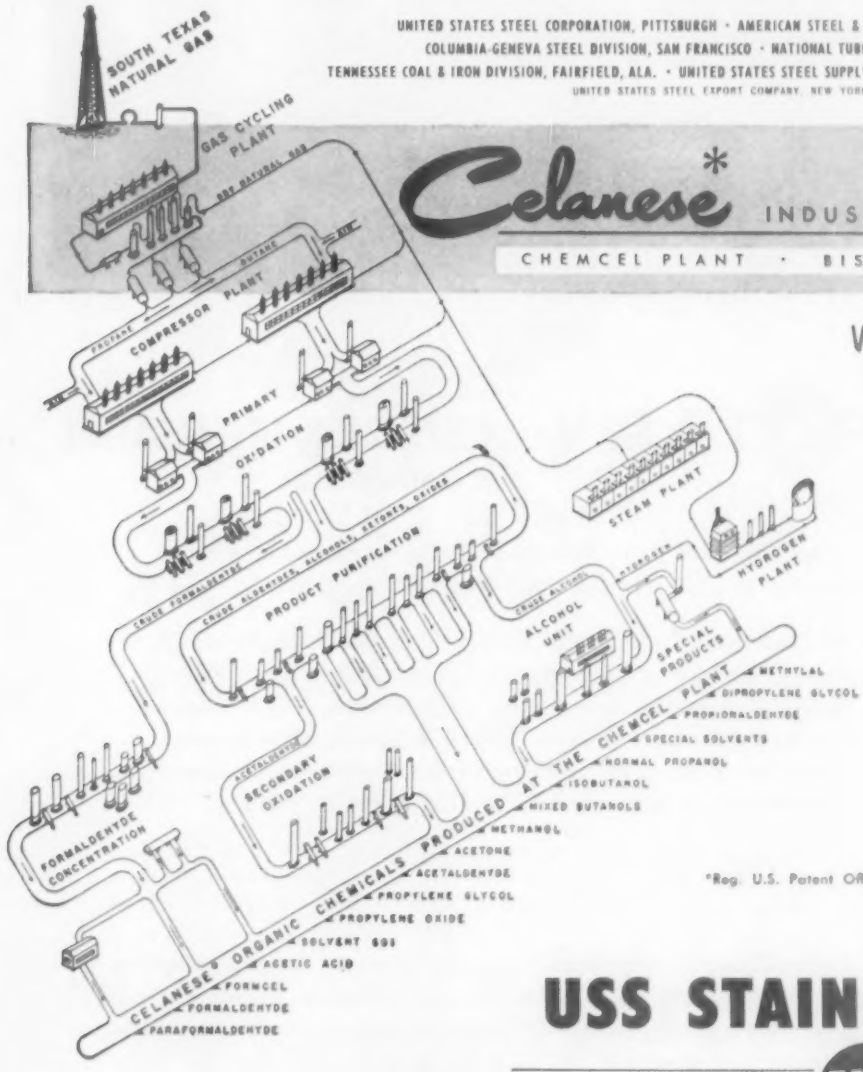

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CHEMCEL PLANT · BISHOP, TEXAS

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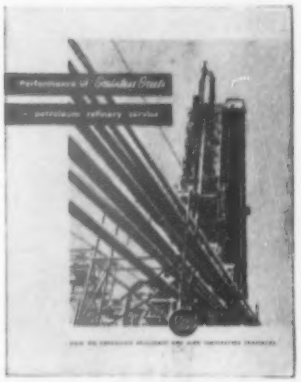
For valuable data on corrosion resistance and high temperature properties of the many grades of USS Stainless Steel, send for our book "Performance of Stainless Steels in Petroleum Refinery Service." Write to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



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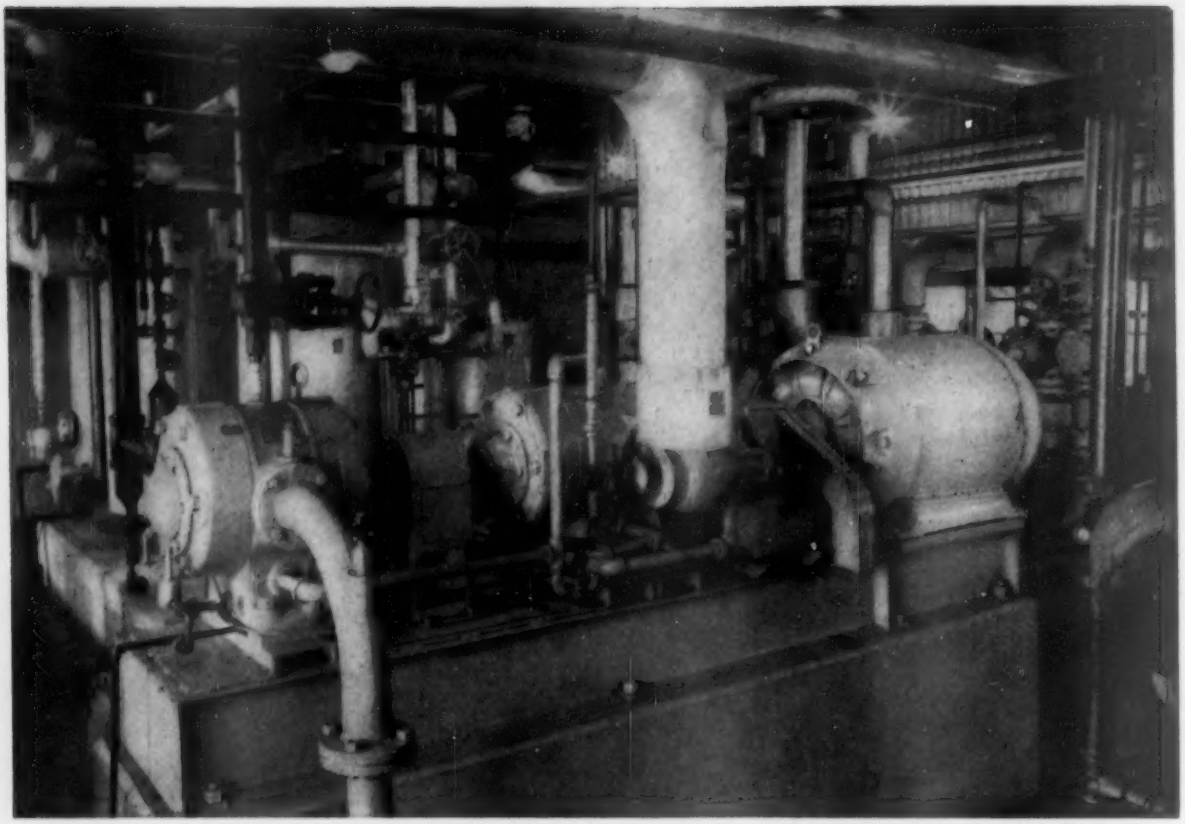

Fuller Rotary C70-70H Two-stage Compressor, 870 r.p.m., rated 340 c.f.m. compressing from atmosphere to 70-lb. gauge, supplying air for plant services.

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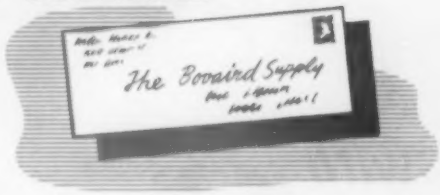

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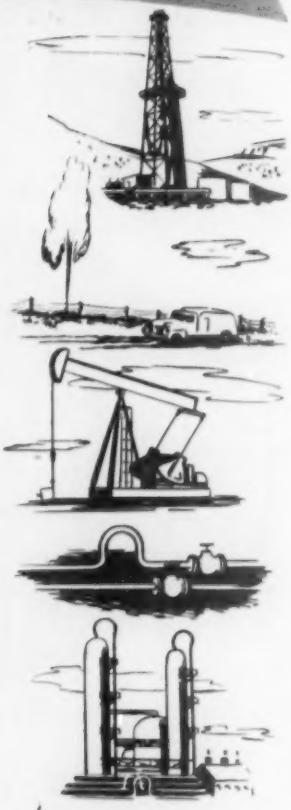

On Your 1955 Development Program

The American Petroleum Institute, in cooperation with engineering, scientific and service organizations, is keeping abreast with the constant advancement in methods, materials and processes in the oil industry. In the financial field, National Bank of Tulsa has the broad experience and resources to finance any sound oil operation. Why not discuss your plans with the Oil Department at NBT?

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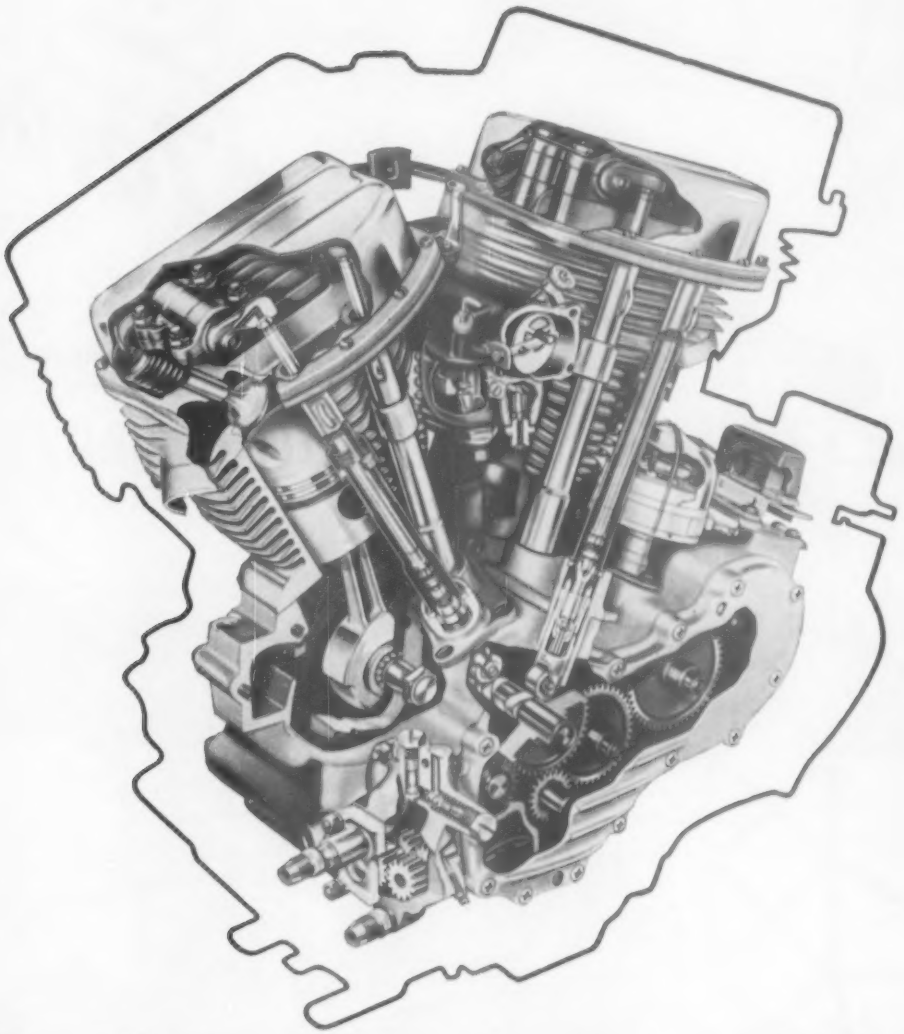

What happens to the transmission when horsepower goes up?

Harley-Davidson faced the problem when it increased horsepower from 30 to 55. In a motorcycle, it usually means a bigger transmission. More steel. Maybe more parts. And more expense.

Company engineers, with the help of Republic metallurgists, took a good look at alloy steels. They chose Republic's 8617 for a lot of reasons. One of them was the reduction of section possible. Another was the good heat-treating and carburizing properties. Still another, it stood up well under the heavy strain of gear teeth.

And, most important, the transmission could stay the same size and still take tremendous impact and stress.

Get an idea from this? Lots of manufacturers have. Like Harley-Davidson, they looked into Republic Alloy Steels. Some of them cut costs. Others made better products. Others got a better competitive position. You can do the same. A call to your nearest Republic Sales Office is all it takes to get started.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
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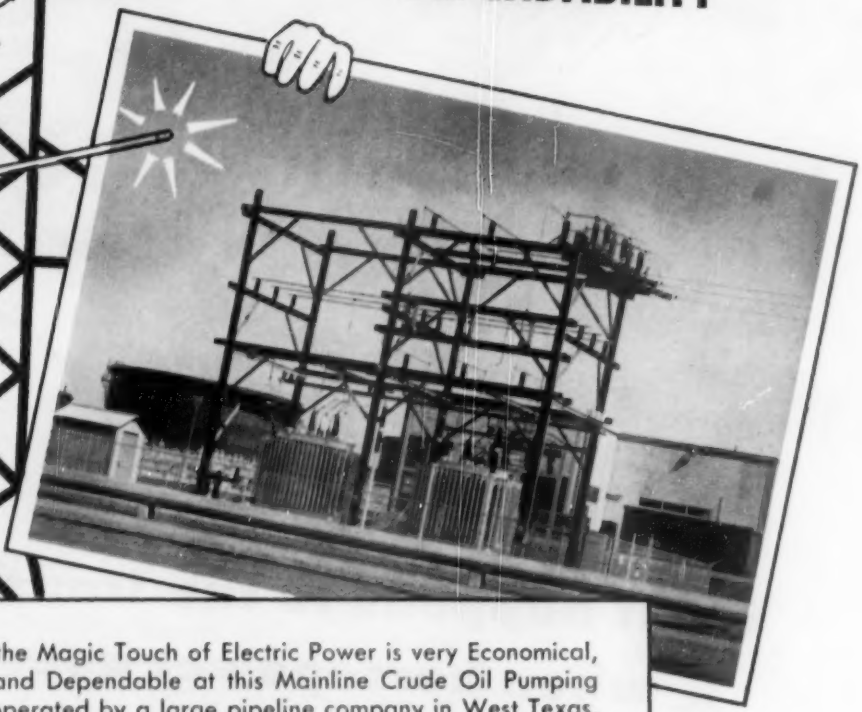
REPUBLIC ALLOY STEELS

The Magic Touch of

Electric Power

MEANS

ECONOMY, EFFICIENCY, DEPENDABILITY



Yes, the Magic Touch of Electric Power is very Economical, Efficient and Dependable at this Mainline Crude Oil Pumping Station, operated by a large pipeline company in West Texas. In this station are three 3,000 H.P. and one 1,250 H.P. motors with over eighty Electrically operated valves. You can readily see that Low Cost Purchased Electric Power is doing a real job with its "Magic Touch." For the BEST ALL-AROUND POWER PERFORMANCE . . . SWITCH to Low Cost Purchased Electric Power . . . TODAY! For full details call your nearest Electric Power Company.

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CALL YOUR NEAREST ELECTRIC SERVICE COMPANY FOR MORE FACTS OR ADDRESS YOUR REQUEST TO P. O. BOX 2771, DALLAS, TEXAS

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THE owners bought this plant before the plans were on paper. You'll be doing that, too, when you sign a contract for your new plant—and you'll have to be *sure* of the qualifications of the firm you hire.

McKee has a long, successful record of sound, practical engineering and construction of projects like yours all over the world. It's the result of accurate analysis and thorough thinking-through of every detail of design, construction and equipment by a well-qualified staff of experienced technical specialists and field personnel.

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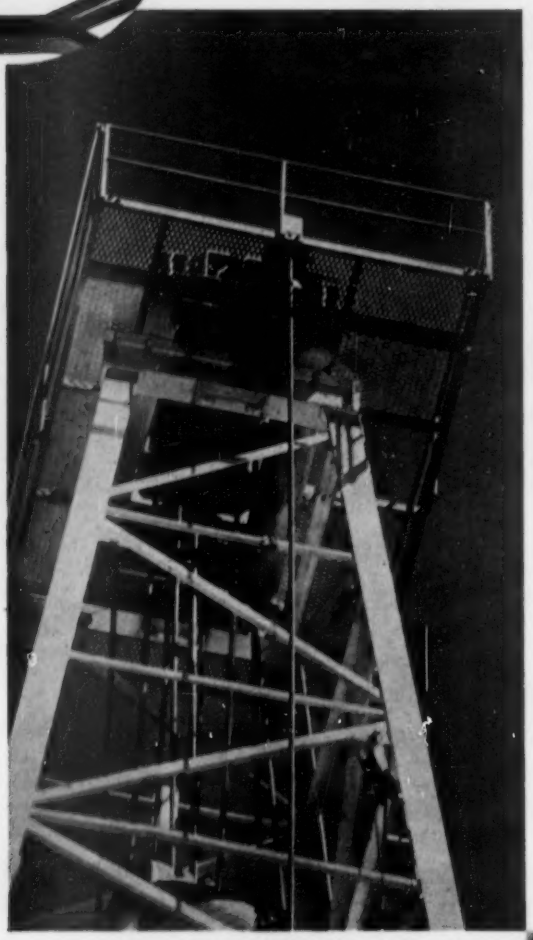
for walkways, catwalks, floors, platforms



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Penmetal gratings are made from heavy steel sheet and plate. The sheet or plate is slit and expanded to form a strong, durable, lightweight surface, capable of supporting walking loads on spans up to four feet, or reinforced for longer spans.

The expanded steel actually deflects less under load than the original sheet. Yet cost is low. Penmetal gratings are not punched, welded, bolted, woven or interlocked. You do not pay for costly fabrication.

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Send for complete details of this open steel flooring of economy. Just fill out the coupon and mail it today.

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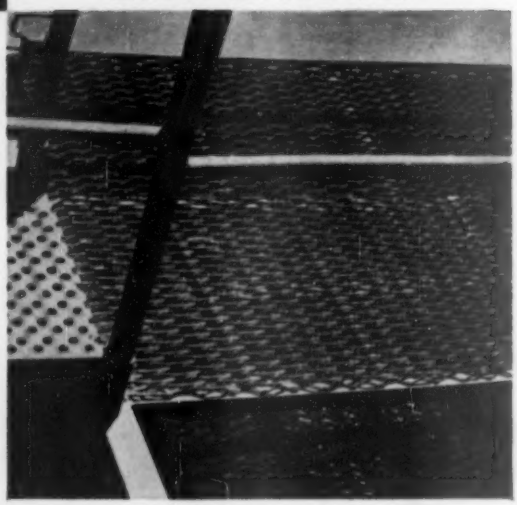
PM-29

Penmetal

Catwalk over open tank in oilfield.



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...it's *Stringtime* in the Rockies

A sure sign that the oil hunters are at work is the seismic string – the "jugs" and cable used in recording shock waves from charges the seismic crews fire as they search for spots where oil might be found. The strings are busy in the Rockies these days and among the busiest are those from Shell Oil Company. The work of the seismic crews is one of the many costly operations undertaken in the continuous exploration for new oil fields – to serve a nation that moves on petroleum.

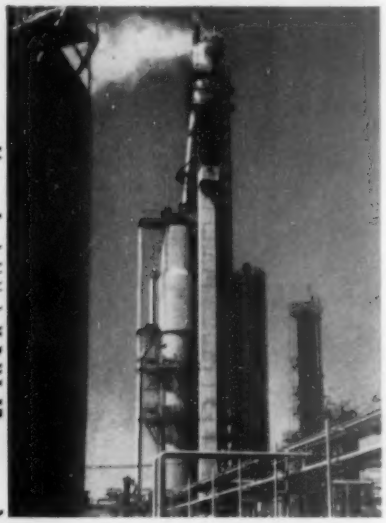
SHELL

SHELL OIL COMPANY

Capsule Case History:

Hard nut to crack!

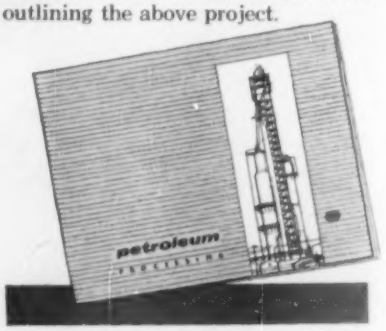
How to expand a plant with a minimum of interference to operations is a problem that calls for an ingenious solution. One example of Kaiser Engineers' planning foresight is its outstanding record of maintaining operating efficiency during the construction period.



A Modern Moving Bed Cat-Cracker was added to a southwest refinery increasing the processing capacity to 19,000 barrels per day. Auxiliary installations included a vis-breaker, vacuum flash tower, syn-crude tower and tar separator.

Downtime to place this unit on stream, was reduced to a minimum even though accelerated scheduling in the fuel oil section was necessary to assist the client in meeting unusual marketing conditions.

Write today for Kaiser Engineers' new petroleum brochure (No. 103) outlining the above project.



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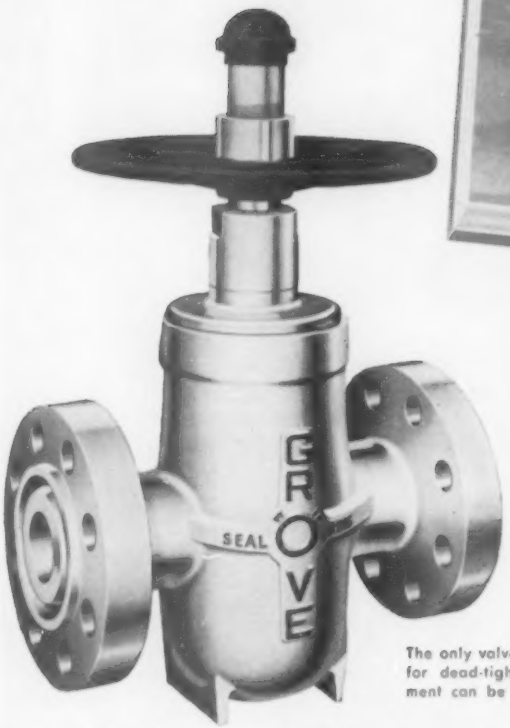

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The only valve you can check in the line—anytime for dead-tight shutoff. Freedom of gate movement can be checked without breaking the seal.

Special valves have long been important in Grove engineering and production. But, with the unprecedented acceptance of Grove *standard valve* design and performance—*valves* have become a major factor in the company's operation. Recognition of this importance is now carried in the name GROVE *VALVE* AND REGULATOR COMPANY.

Grove Seal-"O"-Ring Gate Valves, which have been responsible for this expansion, offer the ultimate in dependable valve operation for oil and gas production and pipeline services. Unparalleled ease of operation and positive bubble-tight seal are but two of the salient features that account for widespread interest and adoption of this revolutionary through-conduit gate valve.

With nothing so constant as change, Grove's basic objective to provide better equipment for the oil and gas industry has resulted in this change in our company name.

Available through leading oil field supply houses 406

GROVE SEAL-"O"-RING Gate Valves

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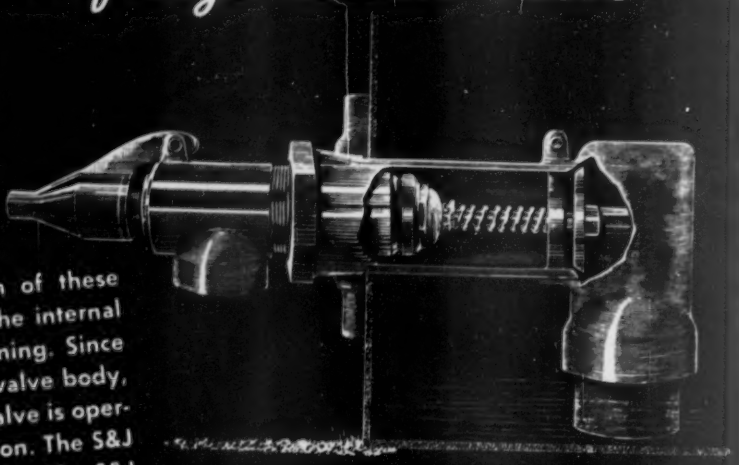
BUTTON UP YOUR TANK'S OVERCOAT

with S&J Anti-freeze Drain Valve

With winter on its way, that is figuratively what you do when you install Shand & Jurs Anti-Freeze Drain Valves in your petroleum storage tanks. The S&J Anti-Freeze Drain Valve is designed to draw off the water that accumulates in the bottom of these tanks. It is so constructed that the internal parts of the valve are self draining. Since water does not stay inside the valve body, freezing is prevented and the valve is operable under any weather condition. The S&J Anti-Freeze Drain Valve, designated by S&J as Fig. ST-2001, is adaptable to any type of petroleum tank.



Above: Fig. ST-2001 AV Anti-Freeze Drain Valve with auxiliary valve which permits removal of the Drain Valve from a tank without draining tank contents.

At the right: Fig. ST-2001 Anti-Freeze Drain Valve with adapter for Cone roof tanks.

★

The S&J Anti-Freeze Drain Valve, Fig. ST-2001 is available in 2", 3" and 4" sizes. Illustrated at the right.

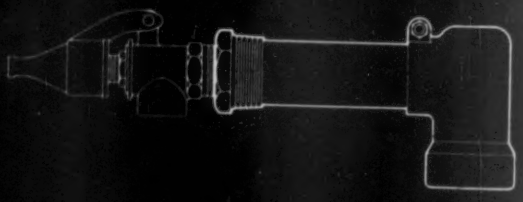


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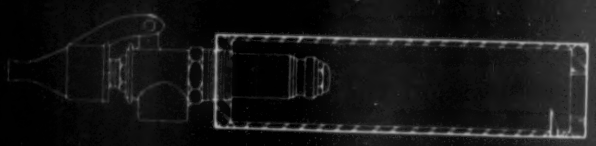
Fig. ST-2001 S Anti-Freeze Drain Valve with eccentric sleeve, designed for use in Spheroids and other tanks with curved bottoms.



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BEATS CORROSION

ON GAS TRANSMISSION LINE

The polyethylene protection of Polyken outlasts previous method 3 to 1—with no sign of wear—for Michigan-Wisconsin Pipe Line Company

Compressor Station No. 10 is a key operation of Michigan-Wisconsin Pipe Line Company.

At the cooling tower, with water reaching average temperatures of 130° F., the corrosion problem was serious. Protective paints lasted only three to four months as water used to cool gas in the line sprayed down over pipes.

The answer was *Polyken* Protective Tape Coating No. 910. Now in use for nine months, this polyethylene protection has outlasted previous methods 3 to 1, with no sign of wear, and here's why:

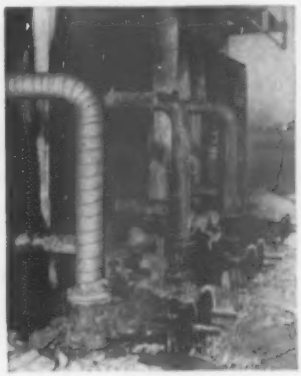
- *Pre-formed plastic film coating* . . . controlled process from reproducible raw materials assures uniform coatings every time.
- *Polyethylene* coating . . . 8 mils of tough, oriented, plastic film, recognized for its excellent resistance against corrosive attack and moisture, and its high dielectric strength.
- *Bonded* securely by a 4 mil stable adhesive (pre-applied to the film), a durable protective barrier in itself.

Less work to apply, too. Use it right off the roll. No heat, liquids, solvents or thinners. No drying time, clean-up time, or shut-down time. Goes on tightly and evenly with a superior bond both to the pipe and to itself on the overlap.

Polyken Protective Tape Coatings are available in two colors: black, No. 900, and gray, No. 910. Mail the coupon below for free test samples.

Cold weather . . . hot pipe . . . and still the job is easy! *Polyken* protective tape coating goes on fast and smooth, bonds tight to the pipe and to itself on the overlap with its special adhesive.

In service nine months with no sign of wear—and two men wrapped these 35-foot 12-inch pipes in less than four hours.



See the difference between the pipe at left protected with *Polyken* tape and rust and corrosion on pipes at right.

Polyken, Dept. OG-K
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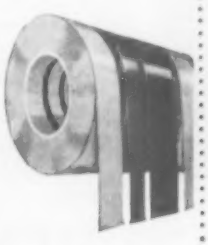

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NATIONAL *Seamless*

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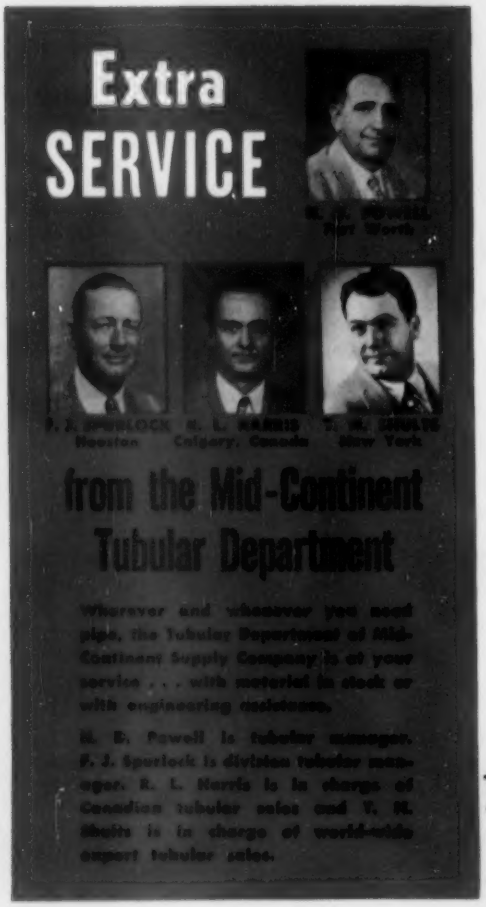
- CASING
- TUBING



WORK it hard . . . work it deep . . . you can rely on "National Seamless" oil field tubular material . . . made by National Tube Division of United States Steel Corporation.

Its strength is your insurance against fatigue and twisting action. Its high collapse resistance is your best defense against deep hole trouble.

Seamless construction and the finest of steels from the world's largest pipe producer are your guarantee of unsurpassed performance. For complete information write to Tubular Department, P. O. Box 189, Fort Worth, Texas.

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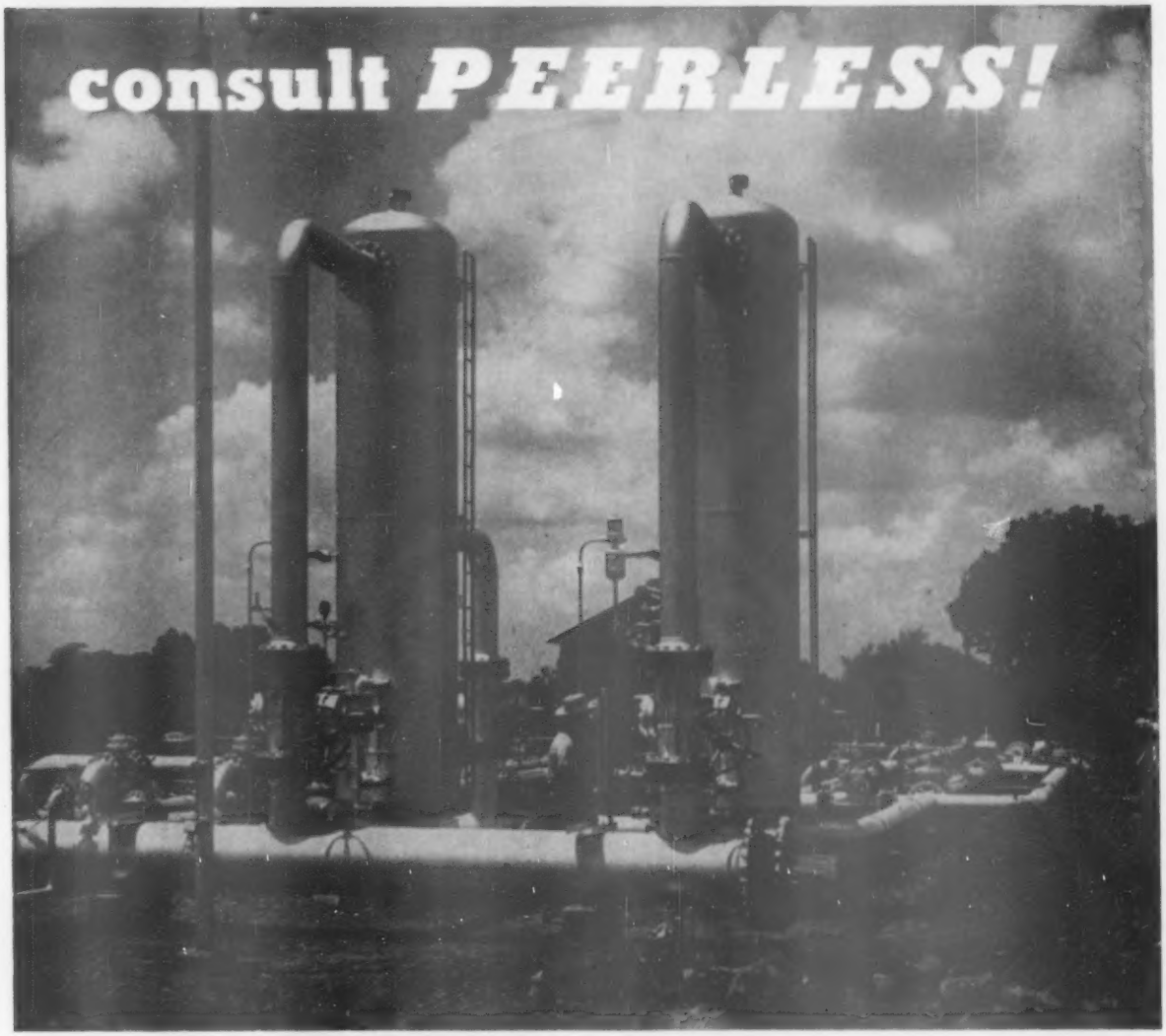
THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

For GAS SCRUBBERS



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Pictured is an installation of TWO 42" x 15' Peerless Gas Scrubbers, at a new Pipeline Compressor Station, in Louisiana. This installation is typical of the many successful applications of Peerless Scrubbers.

Each Peerless Scrubber is designed and built around the famous Peerless Mist Extractor Unit, which guarantees the liquid entrainment loss to be less than 1/10 gallon per million standard cubic feet of flowing gas.

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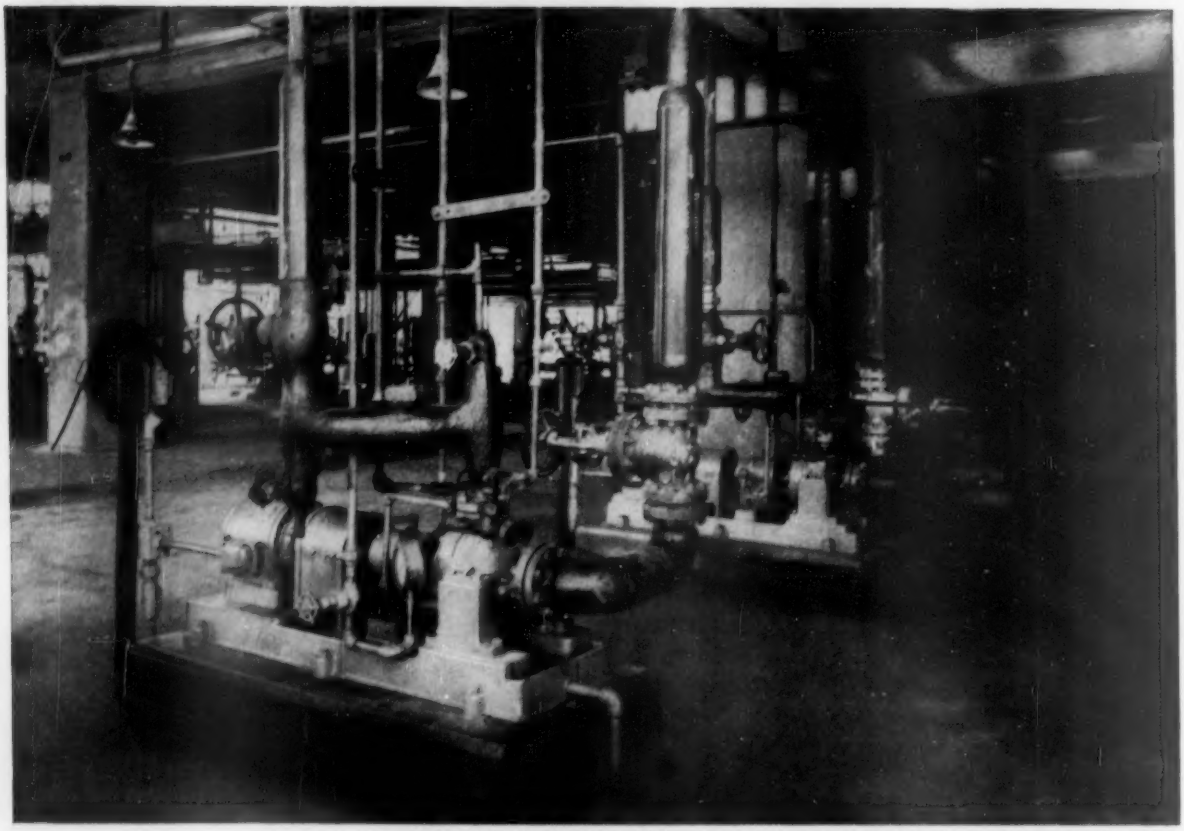

3 OF THE 11 HM PUMPS which set maintenance record at Taylor Oil's cat-cracking plant

11 HM pumps run 2 years for Taylor Oil with only 15 hours' special maintenance!

How long?

Two years with just fifteen man-hours for maintenance other than routine checks. This news came as no surprise, however, to the Worthington engineers who designed and built the Type HM pump *specifically* for tough, heavy-duty work. But it's down in black and white in the maintenance records of the Taylor Oil and Gas Company's cat-cracker in Corpus Christi, Texas.

Here are two reasons why these pumps kept going:

1. Centerline support, water-cooled stuffing box and bearing for efficient high temperature duty.
2. Confined casing gaskets and hook-type hardened stainless steel shaft sleeves.

And piping is simplified because the HM is an end-suction design, which also eliminates interference of valving in suction and discharge lines.

Keep the HM in mind for heavy-duty applications. You can have it in carbon steel, alloy steels or cast iron. Get in touch with your nearest Worthington district office or write for free Bulletin W-341-B14 to Worthington Corporation, Centrifugal Pump Division, Harrison, New Jersey. C.4.3

SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street.

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THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

TYPES HR AND HB. 19 sizes. Capacities up to 1,800 gpm. Developed heads up to 900 ft. Proper selection of material permits use for temperatures far below zero to 800 F, for pressures from high vacuum to 750 psig.

TYPE CNE. For loading or transfer service. Capacities to 2,700 gpm. Heads to 500 ft.

TYPE HM. Available in 12 sizes. Capacities to 700 gpm. Heads to 475 ft. Up to 500 F.

TYPE HD. Hydraulically balanced double-suction impeller handles boiling liquids with low submergence. Capacities range from 600 to 3,200 gpm at heads up to 700 ft. To 850 F. and 550 psig.

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PIPE FITTINGS

reduce piping assembly time

Keeping welding costs down to a minimum and erection schedules on time . . . these are important advantages you can assure to any piping job by installing Ladish Controlled Quality fittings. Metallurgical controls over materials and methods provide an assurance of uniform weldability in every Ladish fitting . . . and thorough inspection to rigid standards of physical dimensions and geometric accuracy assures fast piping assembly.

TO MARK PROGRESS

DURING THE A.P.I. MEETING
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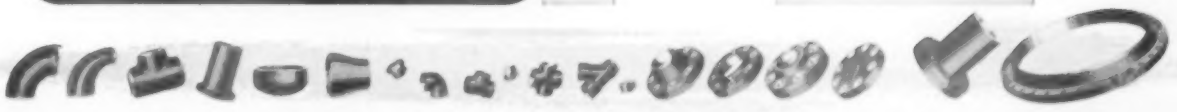

You can depend on GAULIN TRIPLEX PUMPS to keep on working...

Horizontal design of these hydraulic pumping units completely separates cylinder from crankcase, preventing any product leakage to crankcase.

Plexiglas well covers give an instant visual check of cylinder plunger and packing operation.

Corrosion-proof cylinder is made of stainless. Hardened stainless or ceramic plungers available.

Spring-loaded plunger packing is self-adjusting, self-sealing, eliminating the human element.

API ball valves and removable seats permit quick adjustment in the field.

Wide volume and pressure ranges are provided by Gaulins because plunger sizes and drive speeds can be quickly changed in the field.

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M. Les Walraven, Mgr. Oil Field Sales (Oxford 7-6334) (Long Beach 4-1596)

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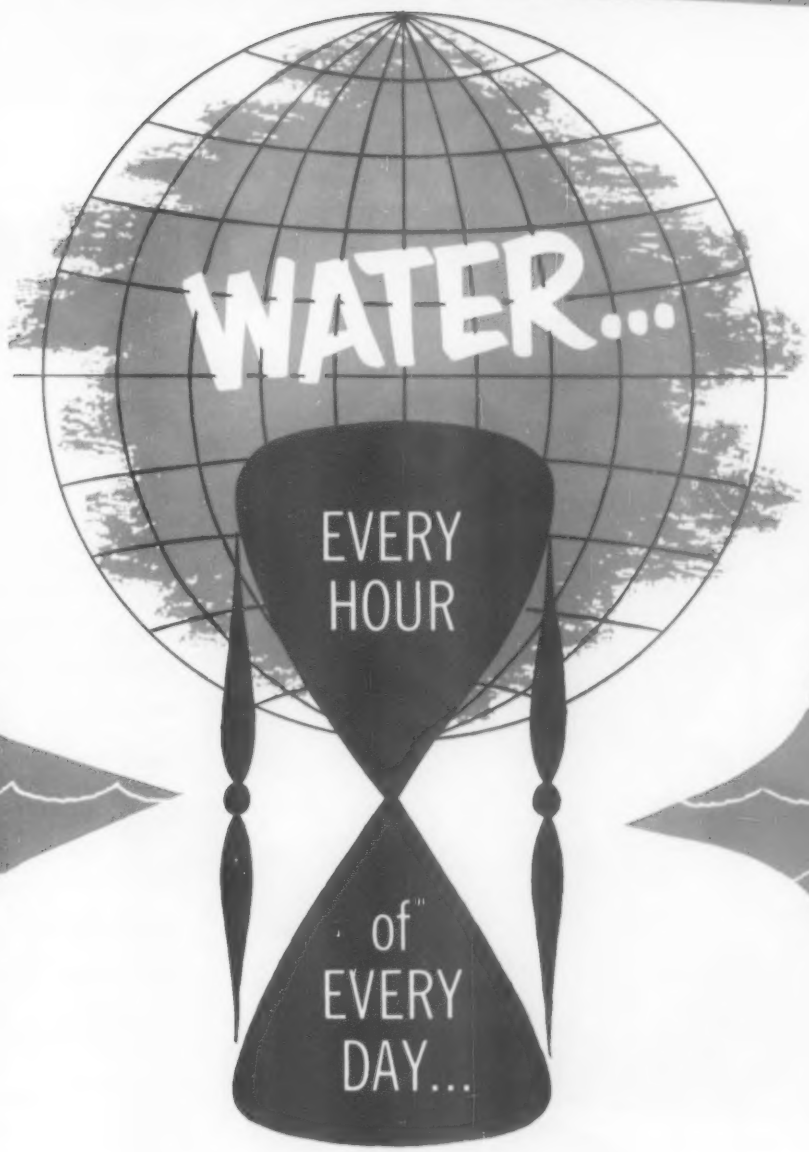
Gaulin
TRADE MARK



Every hour of every day of every month of every year more gallons of water are pumped by Layne pumps than there are people in the whole wide world. That world endorsement of Layne quality and Layne "know how" in developing ground water resources and in engineering water installations is the strongest possible reason for consulting Layne—first—on any question relating to water.

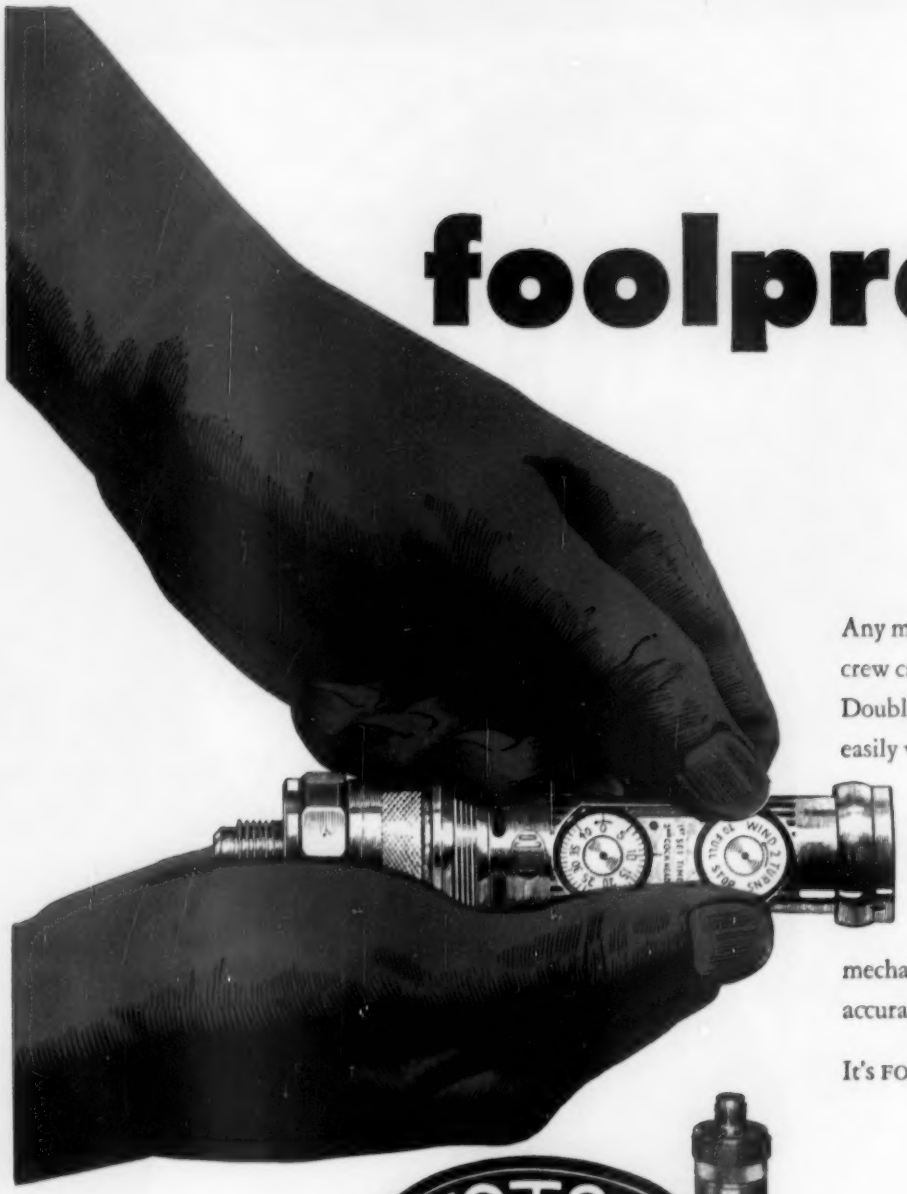
Layne Associate Companies Throughout The World

LAYNE & BOWLER, INC.

Memphis 8, Tennessee

Water Wells • Vertical Turbine Pumps • Water Treatment

foolproof



Any member of the drilling crew can operate a Totco Double Recorder quickly and easily with *accurate* results.

There's no involved procedure—no batteries, chemicals or ink pots . . . just a simple, mechanical instrument that gives accurate readings every time.

It's FOOLPROOF.

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double recorder

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They Say—

Natural-Gas Futility

"Can you imagine the thousands of gas producers who do nothing but drill for and sell gas in the field being subjected to all the controls of a utility company? The production of gas . . . is no more a public utility function than the production of coal or oil, or iron or wheat, or any other commodity.

"I can think of no better means of drying up the gas supply in this country than attempting to subject the gas producers to federal utility controls. . .

"This great country of ours did not attain its world leadership in a strait jacket of price regulation. The only assurance for a continued supply of oil and gas is the economic freedom to search for and develop new underground reserves under our traditional system of competitive enterprise. The liberty we cherish to produce and sell in a free market has given us the best way of life known."

Frank M. Porter, president of American Petroleum Institute, in an Oil Progress Week address in New York.

He Made A "Deal"

"I don't see what they are yelling about. I'm a business man. I made a business deal. I don't hurt anyone. I just caught them (the oil companies) with their pants down.

"Thirty or more years ago when they were writing oil concessions none of them took into consideration the transportation of oil. They stuck to drilling, exploitation, and marketing. When they made these oil agreements transportation was not considered as a major item. As things turned out, particularly after the war, transportation became important and profit-making.

"I just happened to find out about that omission."

Aristotle Socrates Onassis, Greek tanker company owner, in defense of his tanker agreement with Saudi Arabia.

Cat Cracking Advance

"Since the end of World War I, modern cat crackers have stepped up the percentage of motor fuel from a barrel of crude oil by 80 per cent.

"If today's gasoline were refined by 1920 methods, it would take an additional two and a quarter billion barrels of crude oil a year, which is now left in the ground for future use. This amount of crude oil saved each year

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Pulsation Snubbers

Stop Pulsation

Pulsation is dangerous and costly in any plant pumping gas. Designers and operators of hundreds of plants have called on Burgess-Manning Engineers to design gas pulsation snubbers to STOP PULSATION in their operation. Here's the record: Piping failure was eliminated. Gas flow improved for accurate measurement. Downtime eliminated. Less costly piping was installed. Smoother and more efficient equipment operation.

Stop gas pulsation in new plants or eliminate it in existing plants by calling on Burgess-Manning Engineers. Send for performance data today!

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No. 203

Provides Positive Protection for

Well Tubing — Acid Storage Equipment at high as well as low temperatures. Designed specifically for acidizing.

An organic inhibitor; "RODINE" No. 203 does not contain sulphur or arsenic; ingredients known to stimulate embrittlement.

- Not destroyed by H_2S.
- Prevents localized pitting.
- Readily soluble in water or acid.
- Needs no dispersing agent.

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Detroit, Michigan *Niles, California* *Windsor, Ontario*

in terms of gasoline is six times the total production of crude oil by Russia and her satellites. . ."

Rawleigh Warner, chairman of Pure Oil Co., in an address before the Executives' Club of Chicago.

Against Cutting Imports

"The facts are . . . that the domestic-producing industry continues strong and healthy. Recent production cutbacks are moderate, they are due to domestic factors rather than imports, and they are temporary. Under these circumstances, The Texas Co. believes that requests for legislative aid by special-interest groups within the industry are detrimental to both the industry and the nation."

Texaco statement filed with the Cabinet Committee on Energy Supplies and Resources Policy.

The Natural-Gas Frankenstein

"American Louisiana Pipe Line Co. has projected a 30-in. pipeline from Louisiana to Detroit. It was planned that this line would ultimately furnish 700 million cubic feet of gas per day to both Michigan and Wisconsin. Refusal of producers to immediately apply to the Federal Power Commission for certificates of convenience and necessity to sell gas to this pipeline brought a group of citizens from those states scurring to Washington. Their mission was to plead for relief from the effects of the mandate they so long had fought for.

"But only Congress can give relief from the situation which threatens their future gas supply. There is no power in any commission to compel gas producers to contract to sell their gas in interstate commerce if they do not choose to do so.

"Thus the advocates of federal regulation from these two states created a Frankenstein which is turning on them to deprive some 375,000 homes and many industries in these two states of the new or additional natural-gas supplies they so much desire. . ."

K. S. Adams, chairman, Phillips Petroleum Co., in an address before the American Gas Association convention.

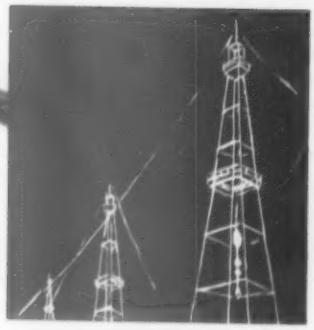
Coal and Fuel Oil

"There is no doubt that coal at present is a severely depressed industry. The current annual rate of bituminous coal output, less than 370 million tons, is the lowest since 1938; it is 42 per cent under the level of 1947, the peak postwar year. . .

". . . The losses of the coal industry have mainly resulted from new technological developments with which coal for one reason or another was unable

OIL

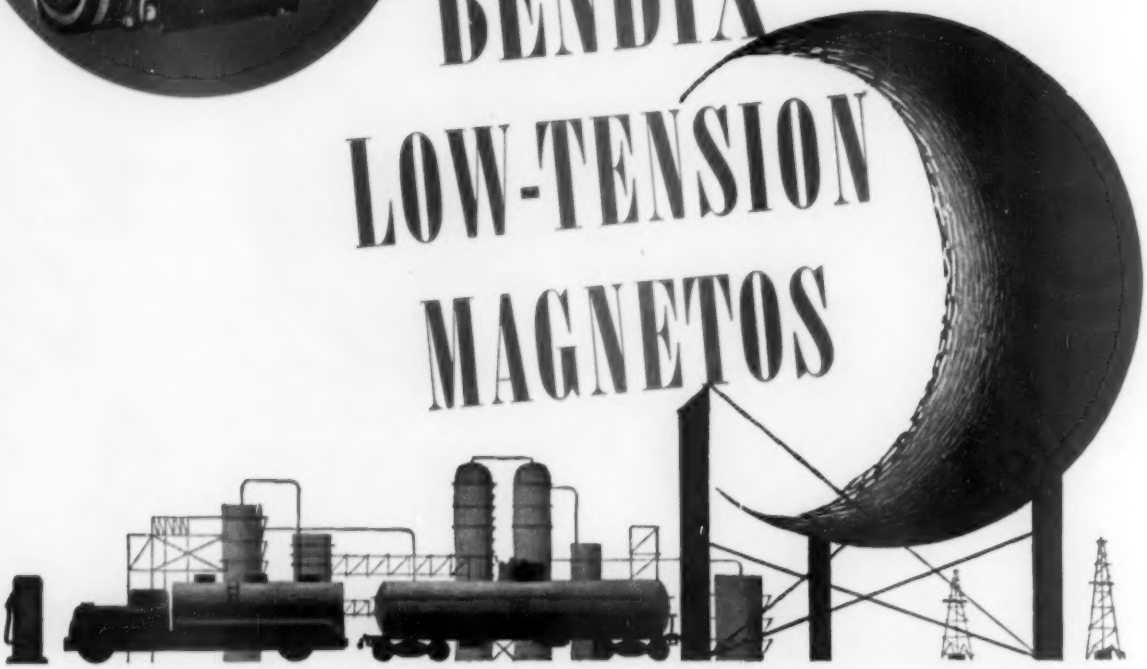
Oil is the basic raw material of modern industry. To live without oil would mean that we would have to revert to the age of the mail coach, the Montgolfière, and the sailing ship. Only by means of the revolutionary invention of the Mannesmann pipe has it become possible to win oil from far below the earth's surface. Depths of 15,000 feet and more have been reached with the aid of Mannesmann seamless steel pipes. The stresses which these pipes have to bear, especially the casings, are extremely high. Mannesmann special casings for oil drilling have proved their reliability in oil fields throughout the world. Mannesmann supplies pipes, containers, apparatus and accessories of every type for the extraction, refining, transport and storage of oil and its by-products.



MANNESMANN-EXPORT GMBH DÜSSELDORF

Designed for the Petroleum Industry—

BENDIX LOW-TENSION MAGNETOS



It's the magneto designed to eliminate fire hazard, foremost problem of the petroleum industry. The special ventilating arrangement of the Bendix Low-Tension Magneto permits air laden with explosive fumes to enter the magneto for ventilation without danger of igniting the surrounding air. Kits are also available to convert magnetos now in use to the "flame-proof" ventilation type.

In addition to this important safety feature, Bendix Low-Tension Magnetos actually reduce engine maintenance and operating costs. For example, spark plug erosion is reduced to a minimum. The distribution of low-tension voltage to the high-tension coils is through a series of breaker assemblies, thus eliminating trouble often experienced with the conventional distributor. Variable or fixed sparks can be obtained by internal adjustment.

For safety and low operating costs it will pay you to specify Bendix Low-Tension for all your magneto requirements. Complete data available on request.

- Low Plug Erosion Rate
- Breaker Type Distributor
- Ventilation without Fire Hazard
- Radio Shielding Available
- Variable or Fixed Ignition

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to keep pace. In fact, fuel oil has itself been adversely affected by technical progress and has likewise lost ground. . . . Fuel oil imports neither constitute dumping nor do they result from inefficient refining operations. . ."

Walter J. Levy, New York economic consultant, in an address before the Empire State Petroleum Association at a Lake Placid, N. Y., meeting.

Atomic Energy Forecast

"Between 10 and 25 years from now, depending on technological developments and prices of competitive fuel, a moderate proportion of the larger new power plants might be built to use atomic fuel, but no efficient existing plant would be shut down or converted to atomic fuel. . ."

Robert E. Wilson, chairman of Standard Oil Co. (Ind.), in an address in New York before the National Industrial Conference Board.

Conservation in Canada

"Since our industry harvests a one-crop yield it must by conservation and scientific approach properly husband and garner that crop. Since a continued supply of oil and gas is essential to the nation's economy and the continuance of our high standard of living, our industry must assume the responsibility of continuously finding new areas from which we can harvest further single-crop yield. This will and can be done only under a system recognizing free enterprise."

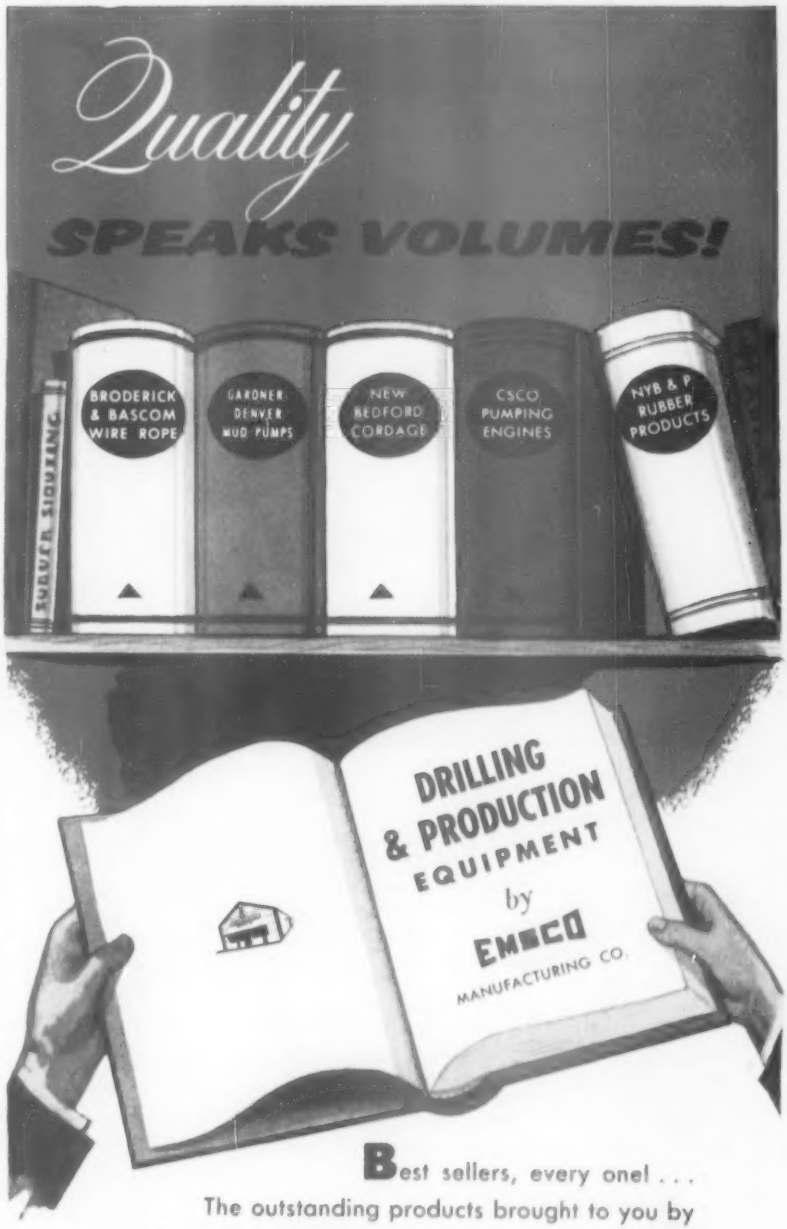
R. H. C. Harrison, Calgary, president of the Canadian Petroleum Association, in an address before the Calgary Kiwanis Club.

World Trade Summary

"Since the war, there has been a significant change in the worldwide flow of oil, and it has been caused by two things: one, the international currency situation, and the other, the rapid development of Middle East crude-oil resources. . .

". . . Most of the European nations do not have enough dollars to satisfy their dollar import requirements. However, British and Dutch companies, in addition to Americans, have oil-producing interests in the Middle East and they are able to sell for sterling instead of dollars . . . This makes it easier for them to buy oil from the Middle East for sterling instead of for dollars from hard-currency sellers, and . . . they conserve their precious dollars for other imports. . .

"The fundamental problem for America in world trade today is to get paid for what we have to sell in money that we can use to pay our operating



Best sellers, every one! . . .
The outstanding products brought to you by Continental reflect *quality* throughout — quality that is complemented in importance by unsurpassed "Green Triangle" Service.

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THE CONTINENTAL SUPPLY COMPANY
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

For sandy pumping use the new D+B 3-tube pump

The new D+B 3-Tube Pump is designed to handle excessively abrasive fluids and to operate efficiently at high bottom hole temperatures.

The D+B 3-Tube Pump consists of three telescoping tubes that are loose-fitting and free-falling. The middle or standing tube is induction-hardened to provide longer life and eliminate galling. The plunger is precision-ground on the O.D. to give longer service.

The loose-fitting plunger prevents sticking and sets up a turbulence that keeps the sand in suspension. An optional bottom discharge valve assembly aids in scavenging sand from the annular space between tubing and pump.

Call your nearest CONTINENTAL or D+B store for details on sub-surface pumps and parts.

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General Offices: Dallas, Texas
Representatives in all principal oil fields of the world

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Houston, Texas
General Sales Offices: Dallas, Texas

E-172

D+B
• DEEP WELL PUMPS
• SUCKER RODS
• COUPLINGS

expenses and dividends to our American shareholders. . .

". . . It seems common sense to me to buy more from them so that they can pay their own way. . .

"The problem . . . boils down to one essential—what happens when economic laws are ignored? The rest of the world, now dependent on our trade, could go on accepting our subsidies. That would mean a slow economic withering until those other countries no longer have the muscle to propel themselves, but must be carried on our backs permanently. Or, countries dependent for their existence on trade can turn aside from our dole and, in these divided times, accept trade with the Communist world. . ."

William J. Haley, former president of Esso Export Corp., in an address before the annual Boston Conference on Distribution.

John L.'s "Fuels Policy"

"Determine the lines of demarcation for the uses of the liquid and solid fuels of this country; not impair the billions of dollars of fixed investment in the coal industry; closely regulate the imports of residual oil . . .; encourage the exporting of larger quantities of U. S. coal into the world market; restore government-sponsored coal research which has been reduced in recent years."

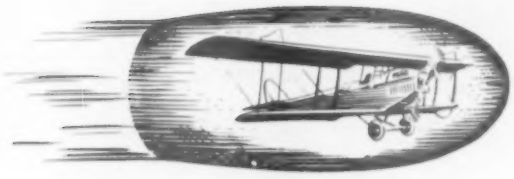
John L. Lewis, president of the United Mine Workers, giving his suggestions for a "national fuels policy" during an interview with representatives of Nation's Business magazine.

Gas Reserves

"The grave danger . . . is that lack of adequate incentive to voluntarily find and sell natural gas will dry up the source of natural-gas supply to the extent that the natural-gas team and the consumer and the public interest will all be seriously injured. . .

"The large-sounding figure on natural-gas reserves are quite apt to lull the consumer, the public, and the distributor into a false sense of security as to the future natural-gas supply available. There were 211 trillion cubic feet of known gas reserves in the United States at the end of 1953. This is equal to 23 years of life at the 9 trillion cubic foot 1953 rate of consumption, but compares with the 29-year life back in 1948. . .

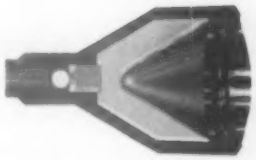
". . . If no new supplies of natural gas had been discovered after 1930, the volumes of gas produced and consumed after such year would have completely wiped out the total 1930 gas reserves by the end of the year 1946. . . The mathematics of this is that total proven gas reserves in the



From a Jenny TO A JET

FROM OBSOLETE METHODS TO MODERN JET PERFORATING

No one derided old bi-plane crates when they were the best available, but they disappeared when better planes were developed. Most operators today are convinced of the superiority of modern jet perforating over older methods . . . have switched over because they get more positive perforating . . . deeper penetrations from Welex Jets. To guarantee better results . . .



Cutaway View of Modern Welex Jet Perforator

Call Welex and be Sure!

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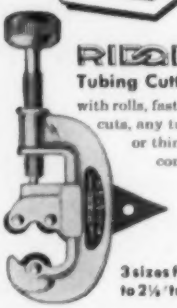
For Easiest Pipe Cutting ...it's a heavy-duty RIDGID

6 sizes:
⅛" to 6"—
4-wheel cutters
to 4"

Every RIDGID Pipe Cutter TESTED for perfect tracking before shipment

Cut more pipe with less work with RIDGID

Once you've put a RIDGID Cutter on a pipe and seen how easily and cleanly it rolls through the metal, you won't want any other kind. Smartly balanced for easy action. Tracks perfectly—and special warp-proof malleable housing keeps it that way. High alloy thin-blade or heavy-duty cutter wheels, practically no burr. For fast cutting with least effort, ask your Supply House for a RIDGID.



RIDGID Tubing Cutter with rolls, fast easy cuts, any tubing or thin wall conduit.

3 sizes for ⅛" to 2⅛" tubing

THE RIDGE TOOL COMPANY, ELYRIA, OHIO, U.S.A.

RIDGID
Work-Saver Pipe Tools

U. S. in 1930 were 46 trillion cubic feet and the total production from 1930 through 1946 was 46.5 trillion cubic feet. . ."

John F. Merriam, president, Independent Natural Gas Association of America and Northern Natural Gas Co., in an address before the Atlantic City meeting of the American Gas Association.

CALENDAR OF EVENTS

NOVEMBER

11-12 American Association of Petroleum Geologists, Pacific section annual meeting, Biltmore Hotel, Los Angeles.
17-18 North Texas Section, American Institute of Mining and Metallurgical Engineers, and Production Committee of the North Texas Oil and Gas Association, symposium on secondary recovery, Wichita Falls, Tex.
18-19 National Association of Corrosion Engineers, fourth annual conference of western region, Hotel Biltmore, Los Angeles.
18-19 Ninth Midwest Quality Control Conference, Society for Quality Control, Dallas.
18-19 Society of Exploration Geophysicists, eighth annual midwestern meeting, Adolphus Hotel, Dallas.
28-Dec. 3 American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4 Interstate Oil Compact Commission, winter meeting, Drake Hotel, Chicago.
2-4 American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.
3 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.
12-15 American Institute of Chemical Engineers, annual meeting, Statler Hotel, New York.

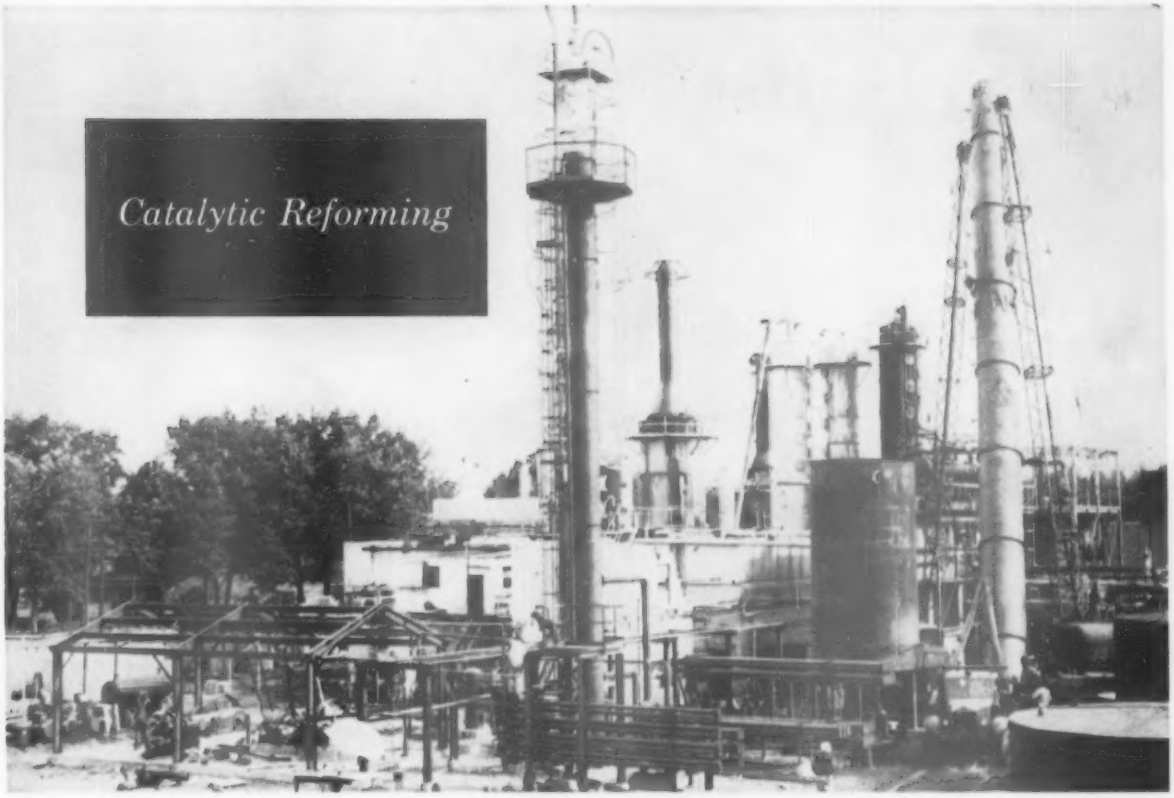
1955

JANUARY

17-18 Kansas Oil Men's Association, annual convention, Baker Hotel, Hutchinson, Kans.
26-28 Symposium on instrumentation for process industries, A. & M. College of Texas, College Station, Tex.
27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

FEBRUARY

13-17 American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.
13-18 A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston.
14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.
16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.



Naph-Sol Refining Company, Muskegon, Michigan . . .
UOP Platformer, during final phase of construction

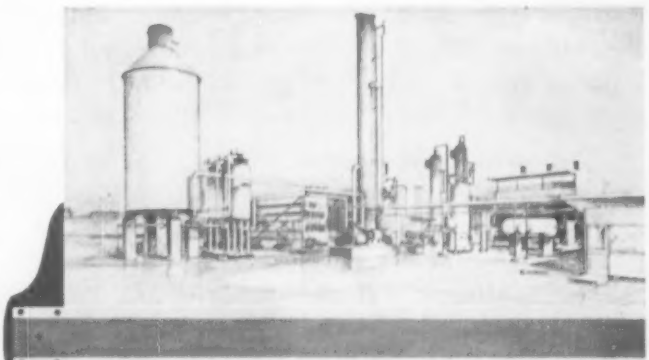
From contract to capacity in 6½ months

Fast but *good* . . . that's what SWECO promised when Naph-Sol decided to enter the high octane race with a SWECO-constructed Catalytic Reforming Plant. In record time, the plant is ready to produce 1,000 barrels per day of high octane gasoline.

SWECO service is *fast* because engineering . . . equipment fabrication and delivery . . . are rigidly coordinated with erection work at the plant site. Experience in our own extensive fabricating shops helps iron out timing problems, whether equipment is made by us or procured from outside suppliers. Close coordination of shop and field work results in substantial economies in both time and money.

Our reputation for doing a *good* job is backed up by 30 years of engineering and construction service. Each job is closely supervised by top home-office and field engineers. Every phase of construction meets the exacting requirements of the process developer.

SWECO is licensed to build the leading types of Catalytic Reforming and other petroleum processes. If you are planning a new plant or modernization of your present facilities, it will pay you to consult SWECO.



Close coordination of engineering, shop work, procurement and field erection resulted in record construction of recently completed Naph-Sol plant depicted above.

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Engineers and Constructors
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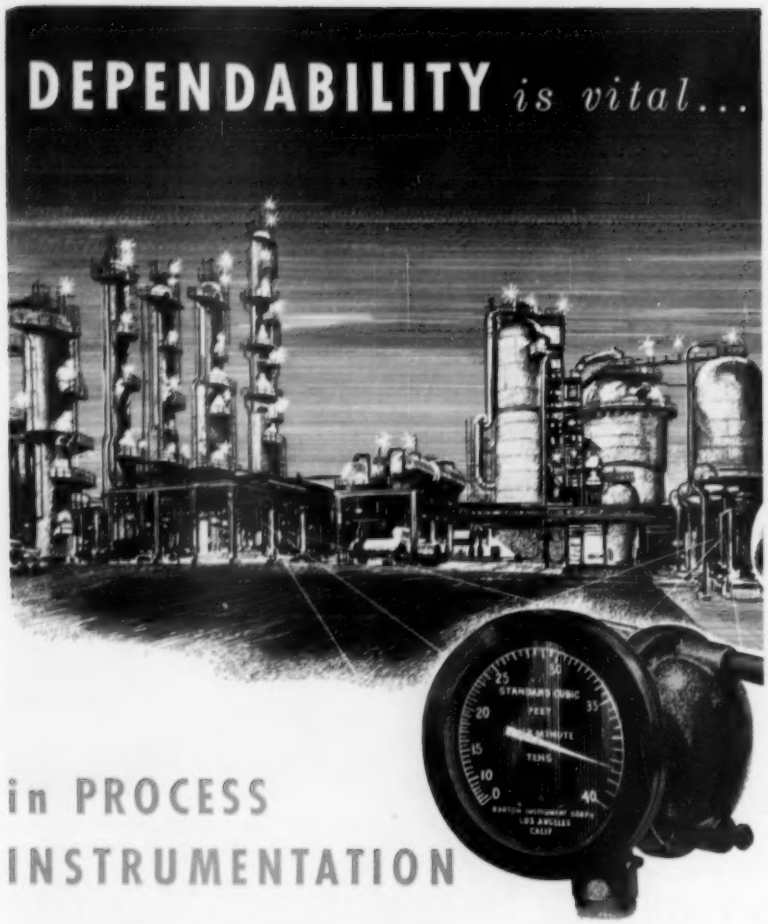
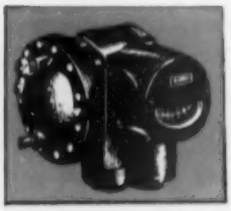


in PROCESS INSTRUMENTATION

BARTON Instruments, in measuring flow, liquid level and differential pressures are meeting the demands of industry with an enviable record. A typical example is the Watson Refinery of the Richfield Oil Corporation near Wilmington, California (illustrated above).

For complete information, contact one of the many experienced Barton Sales Representatives located in most principal cities. The Barton line is fully described in literature, available upon request. Write for Bulletins 11C4 and 211-1.



MODEL 214 INDICATING PNEUMATIC TRANSMITTER

INSPECTION OF ALL THE TINY PARTS THAT MAKE UP BARTON INSTRUMENTS IS A MAJOR OPERATION IN MANUFACTURE.

BARTON INSTRUMENT CORPORATION
INDUSTRIAL INSTRUMENTS
1429 SOUTH EASTERN AVENUE LOS ANGELES 22, CALIFORNIA

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.

7-11 National Association of Corrosion Engineers, Palmer House, Chicago.

9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.

24-25 American Gas Association, gas supply, transmission, and storage conference, Wm. Penn Hotel, Pittsburgh.

27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.

APRIL

13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.

13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.

19-21 Southwestern Gas Measurement Short Course, North Campus. University of Oklahoma, Norman, Okla.

MAY

1-4 Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.

1-4 American Institute of Chemical Engineers, Shamrock Hotel, Houston.

9-10 American Gas Association, gas supply, transmission, and storage conference, Hotel William Penn, Pittsburgh.

9-12 American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.

14-22 World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt Germany.

16-18 American Petroleum Institute, Division of Transportation, products pipeline conference, Edgewater Beach Hotel, Chicago.

16-18 Southern Gas Association, New Orleans, La.

23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.

MAY 30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

5-9 Canadian Gas Association, annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

16-18 Interstate Oil Compact Commission, Denver.

JUNE 28-JULY 1— American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

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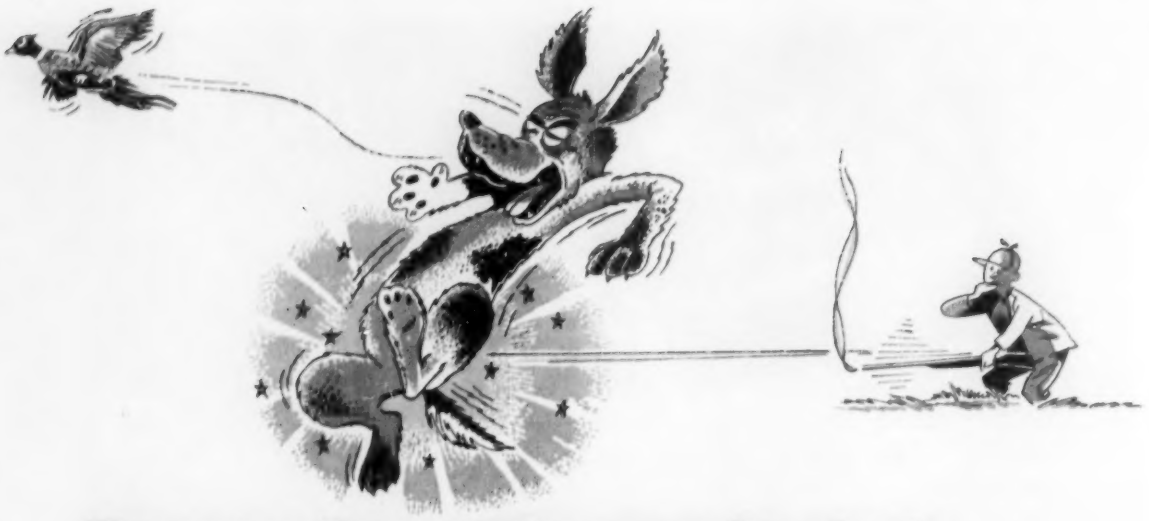
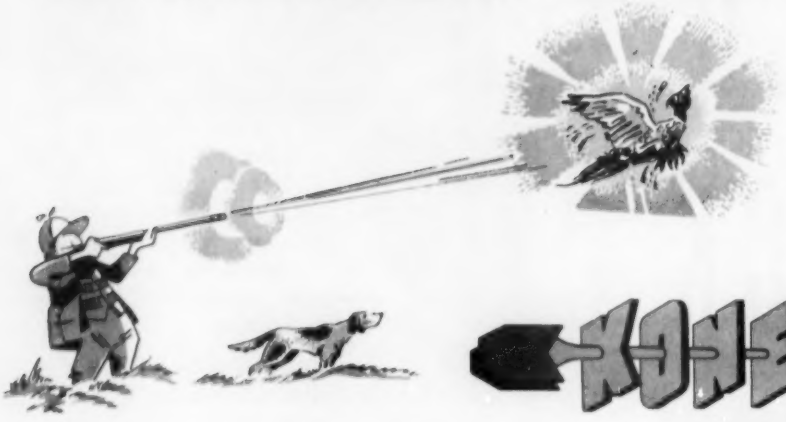


Penetration gets results, but



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THE OIL AND GAS
JOURNAL

TULSA, OKLAHOMA

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JOURNALLY Speaking

Challenge to FPC

HERE'S a serious problem for the Federal Power Commission. Two companies out in the Texas Panhandle are guilty of gross violation of the Natural Gas Act and FPC's Order 174-A. The commission ought to move in immediately and make an example of these companies to teach producers once and for all that they can't play fast and loose with federal authority that way.

Colorado Interstate Gas Co. drilled a well, got gas, and turned it into its interstate transmission line. Okay. Then the Supreme Court said that gas production was subject to FPC control, and FPC issued its order saying that producers could not abandon any deliveries or make any new sales to interstate lines without getting FPC permission first.

So what happens? This Panhandle well, in flagrant disregard of the law, suddenly stopped producing gas and switched over to producing oil—without even a gesture of by-your-leave to FPC.

Under the terms of the contract, Colorado Interstate, which is not in the oil business, turned this renegade well over to Sinclair Oil & Gas Co. Sinclair renumbered it, classified it as an oil well, and connected it to an oil pipeline.

But this impish well, with true Texas independent spirit, again thumbed its nose at the Supreme Court. It quit yielding oil and again began to spout gas. So Colorado Interstate is taking it over again and putting it back on its line.

This foolishness has got to stop. This well had ample judicial notice that it was a natural-gas company under the law and that it could not quit producing gas without a certificate of abandonment from FPC, and could not start producing again without a certificate of public convenience and necessity. In each case it should have filed notice 30 days in advance and waited for official word from Washington before changing its status.

How about this, FPC? Are you going to sit idly by and let an independent producer like this well jump in and out of the gas business at its own sweet will? Is a federal ukase to be ignored like this with impunity? You have a mandate to regulate gas production to maintain a steady supply for interstate commerce, so get on the ball. Make these intransigent Texas wells quit monkeying around and settle down to the important business of turning out plenty of cheap gas for the people up North. Think of those housewives in Detroit.

Stringing Along

LUBRICATING grease is nothing much but a bunch of oily string, according to the latest findings of science. It's full of tiny fibers that have to be magnified 50,000 times before they can be seen. Somebody figured out that all the fibers in a spoonful of grease would reach from here to the moon if laid end to end, but don't ask us how he measured the little things.

It is these fibers, the announcement says, that hold the oil together and make it what it is instead of a liquid. The size and arrangement of these fibers apparently determine the lubricating quality of the grease.

We always knew grease was stringy, and now science has proved it. What grease makers can do with this new knowledge is beyond us. We hope they won't get unstrung by it, but will string along with their old methods until they find some way of untangling the fibers and stringing them out the way they want them.

Little Squirt

A TOY water pistol is now standard equipment for workers in the Billings refinery of Carter Oil Co. A refinery, you know, is a confusing maze of pipes, and some of them are mighty hot. Telling which was which cost workers many a burned finger until they started carrying water pistols. Now one squirt yields a tell-tale sizzle from a hot pipe. Much more sanitary than spitting, and the aim is better, too.

Henry D. Ralph.

When the Sun bears down . . .

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Old problems in acute new forms face the A.P.I.

THEY don't appear on the program in this form, but three subjects will get the lion's share of discussion at the A.P.I. meeting. They are currently the problems of most intense concern to the 6,000 oil men at Chicago and to the half million others who aren't. They are:

- Mounting domestic capacity to produce and refine oil in excess of current consumption rates.
- Continued high imports and the potentialities for pushing them still higher.
- Federal regulation of gas production.

Few such problems, of course, are actually solved at an A.P.I. meeting. But threshing them out is a necessary preliminary to evolving solutions, and this biggest of all oil-industry forums is a good place to make progress toward finding satisfactory answers.

SOME ANSWERS MUST BE FOUND somewhere, for these three problems are exceedingly acute at the moment. If the A.P.I. meeting, officially or unofficially, can't chart a course toward the right solutions, pressure for some wrong solutions may come from other sources.

These problems may never be erased, but unless they are "contained" (to use a military phrase) the industry will be in a lot of trouble for a long time. The danger is not so much the immediate situation as the prospect that, if left to themselves, all three problems may get worse before they get better.

If it isn't one thing it's another in this oil business. There is always a batch of problems. But, looking back over the history of the A.P.I., it seems that the industry is almost perpetually grappling with the three problems of balancing supply with demand, international relations, and threat of government control.

ONLY THEY CROP UP IN DIFFERENT FORMS every year. Just two short years ago, for example, the A.P.I. meeting centered around supplying enough oil to meet the expanding needs of the free world and to stop the communist threat in Korea. Less than a decade ago the chief problem in foreign operations was how to expand without the encumbrance of an Anglo-American treaty.

The chronic threat of government control—one of the motivating factors in formation of the A.P.I. some 30 years ago and a perennial problem ever since—seemed quiescent until it suddenly broke out in this new and virulent form of gas regulation.

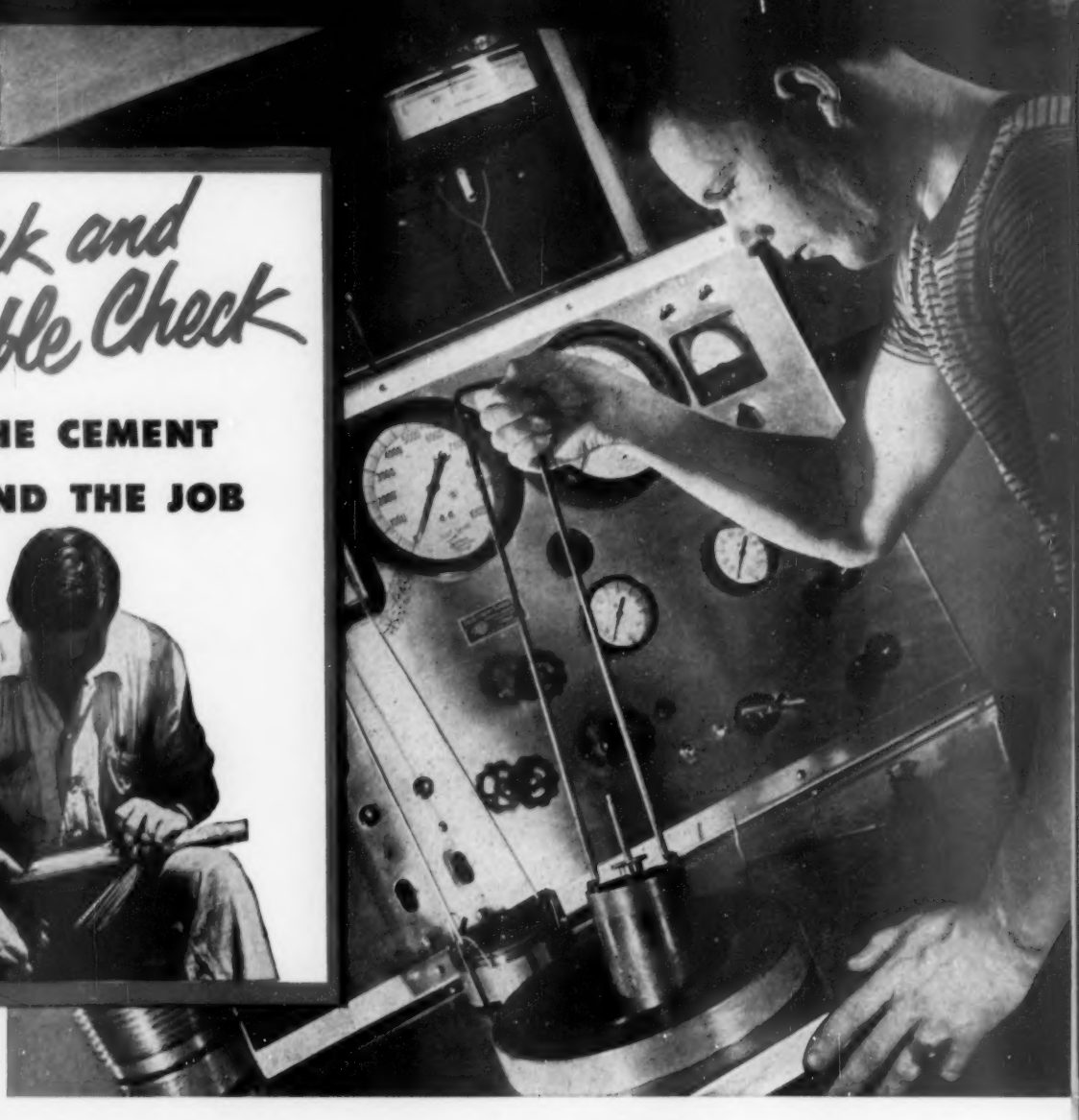
All of which is a reminder that the industry can never relax its guard, must always be on the alert to anticipate its problems and guide their solutions. The public's interest in oil is so great that if the industry doesn't handle its own problems, somebody else will.

Check and Double Check

✓ THE CEMENT

✓✓ AND THE JOB

Standard Oil Co. (N. J.) Photo



●In line with the ounce-of-prevention precept, the Oil Man checks conditions before cementing a well . . . then double checks by temperature log to see how the cement is distributed around the casing.

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THIS WEEK... ...IN THE NEWS

THIS WELL MADE ARIZONA the thirtieth state in the nation with oil or gas production in commercial quantities. The discovery, Shell Oil Co. 2 East Boundary Butte, is in Apache County in the northeastern corner of the state. It is in the Black Mesa basin about 8 miles southeast of Utah's Boundary Butte field. The wildcat was shut in with static pressure of 1,100 psi. after flowing 2,500 M.c.f. of gas per day, along with 12 bbl. of water and a trace of oil, through ½-in. choke. It flowed 13 hours at stabilized rate of 2,200 M.c.f. per day with 32 bbl. of fluid per day testing 64 per cent water. The well is 3½ miles west of recent noncommercial gas discovery.

INDUSTRY—The thirty-fourth annual American Petroleum Institute meeting opens today in Chicago. . . . An estimated 6,000 expected at the 4-day meeting. . . . ¶Sinclair Oil Corp. is negotiating for the purchase of American Republics Corp. in what would be a $108 million deal. . . . If Sinclair acquires company, it will be another step in a drive to improve production position. . . . Negotiations could be completed in a week, but may run for several weeks. . . . ¶Continental Oil reportedly is negotiating for the purchase of Kirby Petroleum Co., Houston, a firm in which the Clint Murchison interests of Dallas are a large stockholder. . . . ¶L. F. McCollum, Continental president, is head of a new committee designed to tell the industry's story to the natural-gas consumer. . . .

OFFSHORE—Biggest mobile drilling platform is to go into operation in 50 ft. of water 17 miles east of Freeport, Tex. . . . ¶World's longest submarine pipeline, about one-third completed, now stretches 17 miles into the Gulf of Mexico. . . . When finished, it will extend to the most distant production yet found on the Continental Shelf. . . . ¶The California Co. plans at least 16 more wells in Bay Marchand field off the coast of Louisiana. . . . ¶Portions of the Long Beach Harbor area may sink 30 ft. if drilling operations continue and depleted zones are not repressurized. . . .

EXPLORATION—Two key wildcats in Tejon Ranch field in California's San Joaquin Valley may extend field to 1,200 acres. . . . One well testing, the other drilling. . . . ¶Exploration is at an all-time high in Beaver County in Oklahoma's Panhandle after a 2-year lull. . . . ¶Although it has not been determined definitely that Pacific Northwest Pipeline will be built, exploration continues at a high pitch at points along the route of the 1,899-mile route. . . .

PRODUCTION—Texas Railroad Commission approves plans for injection of L.P.G. before conventional water flood in Camp field. . . . Buttram Petroleum Corp. estimates new technique will mean recovery of 9,000 bbl. per acre from field with no present production. . . . ¶Cities Service asks permission to water flood San Andres sand in West Texas' Welch field. . . . Cities Service estimates additional recovery at 1,644,000 bbl. . . . ¶American Trading & Production Co. plans pilot water flood of McMillan sand underlying Lindemann field. . . . If successful, project would be expanded to recover estimated 1,000,000 bbl. . . . ¶Pilot water flood of 20 acres in Wyoming's Salt Creek field to be used as test of feasibility for field-wide flood.

INTERNATIONAL—Kindlier attitude toward foreign oil money is noticeable in Latin America. . . . Several countries indicate they may be about ready to open new regime to private exploration. . . . ¶Iranian oil settlement becomes a reality as crude exports resume on big scale. . . . ¶Bolivia to export crude to Argentina through new pipeline from Camiri field. . . . ¶Free-world crude production continues its downward trend with U. S. accounting for most of monthly drop. . . .

REFINING—Twenty-six refinery projects with a daily capacity of 125,000 bbl. have been canceled after receiving a quick tax writeoff. . . . ¶Rubarite, a new asphalt additive composed of synthetic rubber and barites, may open new asphalt markets for refiners. . . .

AT THE A.P.I. . . .

These officers will direct activities . . .

FRANK M. PORTER
Fain-Porter Drilling Co.
President

P. C. SPENCER
Sinclair Oil Corp.
Board Chairman

JOHN G. PEW
Sun Oil Co.
Vice Pres., Production

. . . these men will head standing committees . . .

H. S. M. BURNS
Shell Oil Co.

J. C. DONNELL, II
Ohio Oil Co.

JOSEPH N. PEW, JR.
Sun Oil Co.

A.P.I. Meeting Opens Today at Chicago

CHICAGO—The "Windy City" became "Oil City" again this week—if only temporarily—as more than 6,000 oil men, executives, technical experts, and their speaker-guests from Government and related industries gathered here for the thirty-fourth annual meeting of the American Petroleum Institute.

Sessions of the biggest single oil industry meeting of the year will once again be divided between the Conrad Hilton Hotel and the Palmer House during the 4 days of meetings.

The group sessions open Monday, November 8, and continue through Wednesday, November 10. As in previous years, the various A.P.I. divisions and committees will hold independent sessions devoted to the varied phases and problems of the oil industry through the first 3 days of the meeting. There will be 17 of these group sessions on subjects ranging from public relations to fundamental research.

The two general sessions of the meeting are scheduled for Wednesday, November 10, and Thursday, November 11.

. . . and these will preside at the meeting sessions . . .

The November 15 issue of The Oil and Gas Journal will carry comprehensive coverage of the A.P.I.'s Chicago meeting as compiled by a six-man team from the Journal's editorial staff.

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Vice Pres., Refining

R. M. BARTLETT
Gulf Oil Corp.
Vice Pres., Marketing

CHARLES S. JONES
Richfield Oil Corp.
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Pure Oil Co.

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MAX LORIMORE
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R. B. McLAUGHLIN
Texas Pipe Line Co.

SAM C. OLIPHANT
Tennessee Production Co.

H. C. PACKARD
Shell Oil Co.

JOSEPH P. WALSH
Sinclair Oil Corp.

AT THE A.P.I. . . .

Speakers for the Chicago Meeting

- Forty-two national, industry leaders to address seventeen group meetings, two general sessions of thirty-fourth annual meeting of the American Petroleum Institute.

ROBERT B. ANDERSON
Department of Defense

JOHN W. BOATWRIGHT
Standard Oil Co. (Ind.)

SPEAKERS from government agencies, all phases of the oil industry and related industries will address the thirty-fourth annual meeting of the American Petroleum Institute in Chicago this week. Most of them will present papers on aspects of the industry's technical operations, but others will cover subjects only related to the oil industry. The entire program appears on page 116.

GEN. LUCIUS CLAY
Continental Can Co.

M. S. COLLETT
Atlantic Refining Co.

GEORGE N. CRAIG
Governor of Indiana

S. H. DOWDELL
British American Oil Co.

ROBERT G. DUNLOP
Sun Oil Co.

ALLYN P. EVANS
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Tennessee Gas Transmission

N. E. TANNER
Trans-Canada Pipe Lines

W. M. VAUGHEY
Independent Petroleum Assn.

MAJ. GEN. P. F. YOUNT
United States Army

AT THE A.P.I. . . .

Program Offers Varied Subjects

CHICAGO.—In addition to technical and industry experts, the 6,000 representatives of the American oil and gas industry will hear from bankers, military men and government officials at the annual meeting of the American Petroleum Institute here.

Each of these outside-the-industry speakers will talk about things that are closely related to the oil business. A banker, David Rockefeller, will talk on foreign policy and the businessman's part in it; Maj. Gen. Paul F. Yount, the army's chief of transportation, will be a featured speaker at a transportation group session; and Jerome Kuykendall, chairman of the Federal Power Commission, will talk about the most-talked-about subject in the industry today—regulation of the gas industry.

The oil men will hear from the governors of both Indiana and Louisiana, the navy's chief of shipbuilding, the Secretary of the Interior, and a Deputy Secretary of Defense. In addition the A.P.I. membership will see one of its members receive a gold medal award of achievement and 29 others presented certificates of appreciation for their efforts in the industry.

Here's Who'll Be Doing What and When at the A.P.I. Meeting

MONDAY, NOVEMBER 8

Fundamental Research, 9:30 a.m.

"Analysis, Purification, and Properties of Petroleum Hydrocarbons (Project 6)," Sherman S. Shaffer, Humble Oil & Refining Co., Baytown, Tex.; "Synthesis and Properties of High-Molecular-Weight Hydrocarbons (Project 42)," H. Sutherland, Shell Development Co., New York; "Synthesis, Purification, and Properties of Hydrocarbons of Low Molecular Weight (Project 45)," Wheeler G. Lovell, Ethyl Corp., Detroit; "Data on Hydrocarbons and Related Hydrocarbon Compounds (Project 44)," Arthur L. Lyman, California Research Corp., San Francisco; "Thermodynamic Properties of Hydrocarbons and Related Compounds (Project 50)," R. Robert Brattain, Shell Development Co., Emeryville, Calif.; "Synthesis, Properties, and Identification of Sulfur Compounds in Petroleum (Project 48)," W. D. Seyfried, Humble Oil & Refining Co., Baytown, Tex.; "Nitrogen Constituents in Petroleum (Project 52)," G. R. Lake, Union Oil Co. of California, Brea, Calif.

Public Relations, 11 a.m.

"Industry Must Speak Up," Robert F. Kennon, governor of Louisiana.

Division of Refining, 2 p.m.

"The Businessman's Role in Foreign Policy," David Rockefeller, senior vice president, Chase National Bank, New York; "What Progress in Weather Forecasting?," Francis W. Reichelderfer, chief, Weather Bureau, U. S. Department of Commerce.

Symposium on Measurement, 2 p.m.

"Ninety-five Years of Bulk-Oil Measurement," group paper to be presented by J. Delbert Jones, Gulf Refining Co., Tulsa; "Present Methods of Bulk-Oil Measurement and Desired Improvements," group paper to be presented by S. H. Dowdell, British American Oil Co., Ltd., Toronto; "A Glance into Bulk-Oil Measurement of the Future," group paper to be presented by J. H. McClintock, Esso Standard Oil Co., New York; "Management Looks at Bulk-Oil Measurement," group paper to be presented by G. H. Supple, General Petroleum Corp., Los Angeles.

Division of Marketing, 2 p.m.

"The Federal Trade Commission and Business," Edward F. Howrey, chairman, Federal Trade Commission; "The Important Role of Distillate Fuels in the Petroleum Industry," James E. Dyer, president, Sinclair Refining Co., New York; "The Natural-Gas Story in the Home-Heating Market," A. M. Rippel, Phillips Petroleum Co., Bartlesville, Okla.; "How to Make More Families Want Oil Heat," M. N. Vining, general manager, Diesel Oil Sales Co., Seattle.

Division of Transportation, 2 p.m.

"Transportation's Role in the Growth of Integration," John G. McLean, Harvard University, Cambridge, Mass.; "Good Will Is Good Business," Harry G. Schad, Atlantic Refining Co., Philadelphia; "The Army Transportation Corps and the Transportation of POL," Maj. Gen. Paul F. Yount, chief of transportation, U. S. Army.

TUESDAY, NOVEMBER 9

Division of Marketing, 9 a.m.

Open business session.

Financial and Accounting, 10 a.m.

"The Challenge of Industrial Change," Robert G. Dunlop, president, Sun Oil Co., Philadelphia; "Taxation and Economic Progress," P. W. McCracken, University of Michigan, Ann Arbor.

Division of Transportation, 10:30 a.m.

"Why Bend Pipe?", J. C. Stirling, Service Pipe Line Co., Tulsa; "Radiographic Inspection of Petroleum Pipelines," Harold Hovland, Industrial X-Ray Engineers, Seattle; "Filtering Practices," Ivy M. Parker and W. G. Horstman, Plantation Pipe Line Co., Atlanta.

Division of Production, 2 p.m.

"Petrochemical Growth: Will It Affect Oil and Gas Production?", T. G. Hughes, president, Oronite Chemical Co., San Francisco; "Economic Aspects of Natural-Gas Production, Transportation, and Storage," Gardiner Symonds, president, Tennessee Gas Transmission Co., Houston; "Federal Regulation of the Natural-Gas Industry," Jerome K. Kuykendall, chairman, Federal Power Comission.

Financial and Accounting, 2 p.m.

"Shifting Balance of Forces in '55," Edwin B. George, Dun & Bradstreet, Inc., New York; "Accounting Communication with Operating Management," Max Lorimore, Union Oil Co. of California, Los Angeles.

A.P.I.C., 2 p.m.

Address, George N. Craig, governor of Indiana; "At the Crossroads," B. L. Majewski, president, Great American Oil Co., Chicago.

Division of Transportation, 2 p.m.

"Pressure Loss in Oil Pipelines," W. L. Kennedy, Jr., Service Pipe Line Co., Tulsa; "Management's Attitude Toward Corrosion," S. G. Kershner, Texas Pipe Line Co., Houston; "Control of Vapor-Zone Corrosion in Sour-Crude Tanks," A. H. Newberg, Service Pipe Line Co., Tulsa, and J. P. Barrett, Stanolind Oil & Gas Co., Tulsa; "A Venture in Joint Microwave Operations," M. S. Collett, Atlantic Refining Co., Philadelphia.

WEDNESDAY, NOVEMBER 10

General Session, 9:30 a.m.

Remarks, Frank M. Porter, president, American Petroleum Institute; Address, M. J. Rathbone, president, Standard Oil Co. (N.J.), New York; Address, Douglas McKay, Secretary of the Interior.

Division of Production, 2 p.m.

"Economics of Offshore Drilling in the Gulf of Mexico," Dean A. McGee, president, Kerr-McGee Oil Industries, Inc., Oklahoma City; "The Importance of Supervisory Development," R. L. Minckler, president, General Petroleum Corp., Los Angeles; "Outlook for Canadian Oil and Gas Development," N. E. Tanner, president, Trans-Canada Pipe Lines, Ltd., Calgary.

Lubrication Session, 2 p.m.

"The Place of the Engineer in Petroleum Marketing," B. G. Symon, Shell Oil Co., New York; "Coordinated Agreements Imperative to Naval Petroleum Logisticians," Capt. W. C. Latrobe, supervisor of shipbuilding, U. S. Navy, and naval inspector of ordnance, Baltimore; "Changes and Trends in Lubrication Markets," P. V. Keyser, Jr., Socony-Vacuum Oil Co., Inc., New York.

Safety and Fire Protection, 2 p.m.

"A Balanced Program for Highway Safety," Joseph P. Walsh, general counsel, Sinclair Oil Corp., New York; "What Oil Companies Can Do to Reduce Highway Accidents," Stanley Learned, executive committee chairman, and assistant to the president, Phillips Petroleum Co., Bartlesville.

Committee on Petroleum Statistics, 2 p.m.

"The Business Outlook for 1955," Allyn P. Evans, president, Lionel D. Edie & Co., New York; "The Outlook for the Petroleum Industry in 1955," John W. Boatwright, Standard Oil Co. (Ind.), Chicago.

THURSDAY, NOVEMBER 11

General Session, 9:30 a.m.

Address, W. M. Vaughey, president, Independent Petroleum Association of America, Jackson, Miss.; Address, Gen. Lucius D. Clay, chairman of the board, Continental Can Co., New York; Address, Robert B. Anderson, Deputy Secretary of Defense.

Big Sale Brewing

Sinclair may buy American Republics in another step to increase production; transaction would total $108 million

NEW YORK.—American Republics Corp., Houston, may be sold to Sinclair Oil Corp. in a $108,000,000 deal.

The two companies currently are negotiating in New York on the sale. If the deal is closed, American Republics will be liquidated. Tax questions involved in the transaction are under study, and one official said it could be anywhere from a week to 6 or 7 weeks before the outcome is known.

Reports that the sale was under negotiation were confirmed by Torkild (Cap) Rieber, chairman and president of American Republics.

The price being discussed would give American Republics stockholders about $72 a share when the company is dissolved. Since the company has 1,500,000 shares, this means the deal involves around $108,000,000.

American Republics has reserves estimated at around 70 million barrels of crude oil and about 375,000,000,000 cu. ft. of natural gas. Its 1953 production was 12,892 bbl. daily. It held, as of the end of last year, 907,133 net acres of proved and undeveloped oil and gas lands, mostly in Texas. Included is around 900,000 acres in southeastern Texas fields which American Republics holds the mineral fee right together with Houston Oil Co. of Texas.

Rieber said American Republics stockholders may soon be asked to approve a plan of liquidation. He said Sinclair Oil & Gas Co., a Sinclair subsidiary, would operate the properties if the sale is consummated.

Sinclair's interest . . . For Sinclair, the purchase would represent another step in its constant effort to improve its production position. For the first nine months of the year, Sinclair produced 128,569 bbl. net of crude and other hydrocarbon liquids as compared to a refinery capacity of 395,994 bbl. daily. Comparable figures for the first nine months of 1953 were 127,357 bbl. daily and 393,572 bbl. daily.

In 1949 Sinclair mapped a 5-year program to raise production by 50,000 bbl. daily, and since that time output has gone up by some 40,000 bbl. daily above the approximately 88,000 bbl. daily produced when the program was announced. About a year ago, Sinclair contracted with Gulf Oil Corp. for substantial purchases of Middle East crude. The latter part of this year, Sinclair planned imports of around 46,000 bbl. daily from Venezuela and 20,000 bbl. daily from the Middle East.

Previous offer . . . In 1953, Tennessee Gas Transmission Co. sought to buy controlling interest in American Republics for the purpose of merging the company into Tennessee Production Co. in which T.G.T. held 49 per cent interest. T.G.T. offered to buy up to 25 per cent of the interest of certain American Republics stockholders, including Barber Oil Co. which at that time owned 33⅓ per cent of American Republics.

After nearly a year, this plan was called off following of a change in Federal Power Commission requirements affecting the status of producing affiliates of gas transmission companies. In the meantime, however, T.G.T. had acquired an 18.6 per cent interest in American Republics, while Barber Oil's interest dropped to about 25 per cent.

Kirby Sale Studied

Conoco said interested in buying Houston firm

HOUSTON. — Negotiations were reported under way here by Continental Oil Co. in an effort to acquire substantial holdings of Kirby Petroleum Co. of Houston, a 33-year-old firm in which Clint Murchison interests of Dallas hold a large block of stock.

Conoco officials would make no statement, and would neither confirm nor deny that negotiations were under way.

George Sawtelle, Houston, is president of the firm, which has production in Texas, Louisiana, Mississippi, New Mexico, and Canada. The firm owns an interest in more than 500 wells on approximately 60,000 acres. In addition to its producing land, the company also owns nonproducing properties totaling more than 200,000 acres.

Kirby also has two wholly owned subsidiaires: Canadian Kirby Petroleum, Ltd., and Kirby Oil & Gas Co. The Canadian company was organized in 1953, and all Kirby's undeveloped leases and royalties in Canada were transferred to it. Kirby Oil & Gas Co. was then formed, and all stock of the Canadian company was transferred to it.

Late in 1953, common stock of Kirby Oil & Gas was distributed as a stock dividend to common stockholders of Kirby Petroleum on a share-for-share basis.

Murchison interests hold more than 180,000 shares in Kirby, which at the end of 1953 had total assets of $9,669,360. The firm had a net income of $1,014,237 in 1953. There are 600,000 shares of authorized stock and 593,000 shares outstanding.

Other officers of Kirby are: W. T. Hancock, Jr., vice president and general manager; John T. Scott, vice president; and Ben Roshton, secretary-treasurer.

Humble Reserves Revealed

HOUSTON.—Humble Oil & Refining Co. at the end of 1953 held nearly 9 per cent of the nation's proved crude and condensate reserves and more than 7 per cent of its proved gas reserves.

This was revealed last week in a prospectus released by Humble's parent company, Standard Oil Co. (N.J.). The prospectus places Humble's estimated net reserves of crude oil and condensate at 3 billion barrels and its gas reserves at 16 trillion cubic feet at the end of last year. The nation's proved reserves were about 34 billion barrels of crude oil and condensate and 211 trillion cubic feet of gas.

On the basis of the prospectus estimates, Humble, which is the nation's leading oil producer, apparently has the largest oil reserves in the United States. Its gas reserves are believed to be second to the approximately 18 trillion cubic feet owned by Phillips Petroleum Co.

Corning-Grade Crude Cut

BRADFORD, Pa.—Joseph Seep Purchasing Agency of South Penn Oil Co. has cut Corning-grade crude in Central Ohio 7 cents a barrel to $2.65, effective November 1.

The cut keeps the crude in line with recent cuts announced for Illinois basin oil *(The Oil and Gas Journal, November 1, page 58).*

Ashland Oil & Refining Co. posted a price of $2.72 for Corning crude.

Carter Oil Co. and Pure Oil Co. announced reductions of 7 cents to $2.95 to meet the price posted by Ohio Oil Co. for Illinois basin.

It isn't built yet, but . . .

. . . Line Exerts Influence

DENVER.—The proposed $160,000,000 natural-gas pipeline from the San Juan basin to the Pacific Northwest was still up in the air last week, but its influence was being felt all the way from Tacoma to southwestern Colorado.

Officials of the Pacific Northwest Pipeline Corp. have "absolutely no comment" to make regarding construction plans. They are quietly watching and waiting for the outcome of Westcoast Transmission Co., Inc.'s court challenge of the Federal Power Commission go-ahead.

Faced with the prospect of cheap-gas competition, a Tacoma fuel-oil dealer jumped into the fight with an attempt to head off gas. He is offering customers a 10-year guarantee to deliver fuel oil at a lower net cost per B.t.u. than rates charged for either gas or electricity.

In the western Rockies, the exploratary race started by the FPC approval of the line last June gathered speed. Three wildcats in Wyoming's Green River basin give indications of gas discoveries. Two Colorado wells were testing gas flows.

Court challenge . . . Westcoast is continuing the 2-year fight it carried on before the FPC, but it has now taken to the courts. When the FPC gave Pacific Northwest the nod over Westcoast's plan to bring in Canadian gas, the losing company appealed to a Philadelphia federal court *(The Oil and Gas Journal, September 20, page 109)*.

Westcoast wants to pipe gas from Alberta to Fort St. John field in British Columbia and then to Vancouver. The line would end at Portland. Canadian authorities gave their approval, but the FPC favored a domestic supply of gas.

Pacific Northwest plans a 1,899-mile line across seven states from the San Juan basin into the gasless, populous areas of the Northwest Pacific coast. Original plans called for completion of the line late in 1955.

Exploration race . . . Gulf Oil Corp. and Chicago Corp.-Republic Natural Gas Co. report gas on drill-stem tests of wildcats in Wyoming's Sweetwater County, and Mountain Fuel Supply has Morrison gas production at 2 Hetzler, 4 miles northeast of the Chicago-Republic wildcat.

Gulf's well, the 1 Southwest Table Rock Unit, found gas on two drill-stem tests in the company's first venture on a 5,560-acre unit. It is 4½ miles southwest of gas production at The Texas Co. 5 Unit, completed for 8,690 M.c.f. of Mesaverde gas.

The Chicago-Republic wildcat is the 1 Government in Sweetwater County. It recovered gas estimated at 143 M.c.f. daily on one test and 23 M.c.f. on another. Tops were not reported.

In Rio Blanco County, a Colorado wildcat has recovered 4,000 to 5,000 M.c.f. of gas daily. Equity Oil Co. 1 Clubine, 13 miles north of Delta, Colo., will be completed in the Green River (Tertiary).

U. S. Smelting, Refining & Mining Co. has an estimated flow of 20,000 M.c.f. of gas daily at 1 Brown, 3 miles west of Ignacio field in southwestern Colorado along the route of the line.

Fuel-oil's answer . . . In Tacoma, Edwin L. Griffin, president of Griffin Fuel Co., didn't let the fact the line has bogged down hobble his efforts to hold his market. Griffin's 10-year offer for fuel oil below gas prices carries some conditions.

His guarantee is void if natural gas in commercial amounts is discovered in Washington, if nuclear energy brings lower utility rates, or if wartime controls are imposed to affect the price or supply of fuels or electricity.

His offer also is hinged on the customer's use of a nozzle or pressure-type burner.

Griffin reasons that his fuel oil can compete with natural gas piped all the way from San Juan because the area hasn't enough people to support cheap gas.

Products Line Progressing

CHICAGO.—Badger Pipe Line Co. expects to have its 195-mile products line between East Chicago, Ind., and Madison in service by January.

Approximately 25 per cent of the work, which is being handled by three contracting firms, is finished.

Contracting & Material Co., of Evanston, Ill., has a 99-mile section from Lockport to Rockford, Ill. Mid States Construction Co., of Mount Vernon, Ill., has the 56-mile stretch between Mount Vernon and Madison, and Morrison Construction Co., of Hammond, Ind., has the 40-mile spread from East Chicago to Lockport.

The line is owned by The Texas Co., Cities Service Oil Co., Pure Oil Co., and Sinclair Pipe Line Co. Cities Service will operate the system.

Beaver County Busy

Recent discoveries spur activity after long lull

BEAVER CITY, Okla. — After a 2-year lull, Beaver County in the Oklahoma Panhandle is experiencing an all-time high in exploratory and development activity. Current wildcat and development operations promise an extensive drilling program in coming months.

The county's latest major discovery is United Producing Co. 1 Evans, 5 miles northeast of Southwest Mocane field and 5 miles northwest of Southeast Mocane field. It flowed 3,500 M.c.f. of gas per day initially. After acidization, it produced gas at the rate of 40,000 M.c.f. daily, plus some distillate from the Mississippian-Chester at 6,894-6,924 ft.

The discovery also has assured Morrow-Pennsylvanian oil and gas production at 6,680-6,716 ft. On drill-stem tests the well flowed 7,800 M.c.f. of gas per day plus oil at an ungaged rate. United has begun operations at 2 Evans, a 1-mile southwest offset.

Other important developments in busy Beaver County include Rip C. Underwood's 1-A Just, 11 miles east of Grand Valley field. This Morrow prospect is undergoing production tests.

Garr-Woolley 1 Verney Laws, 11 miles south of Floris field, reportedly had good recovery on drill-stem tests of the Pennsylvanian-Marmaton lime.

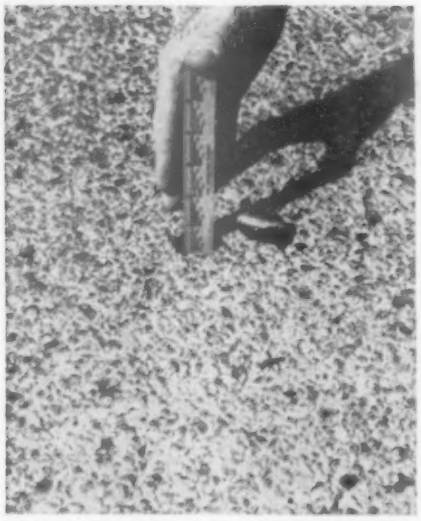
A Pennsylvanian Douglas sand discovery and Morrow sand confirmation to the Southwest Camp Creek discovery well has been shut in 11 miles southeast of Beaver City. The wildcat hit is American Gas Producing Co. 1 Shadden, 1 mile southwest of the field discovery. The Douglas discovery flowed 6,700 M.c.f. of gas per day from perforations at 5,476-94 ft. after acid and fracture. Morrow perforations yielded 1,800 M.c.f. of gas per day on last gage reported at 7,280-99 ft.

Drilling continued at United Producing Co. 1 Barby, 1½ miles southwest of the discovery well of Southeast Mocane field, after gas was reported in the Morrow sand. Cabot Carbon Co. 1 Barby "A" is the third well in the new field. It is 1 mile east of the discovery, Texas Co. 1 Barby "A."

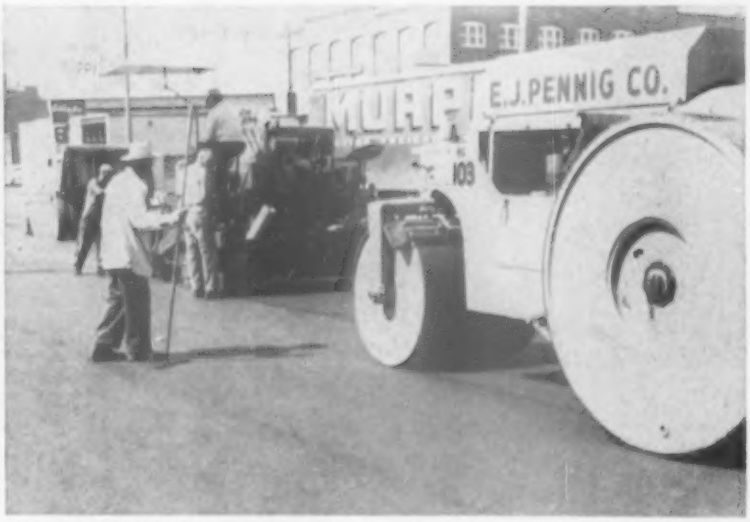
TEL Prices Reduced

NEW YORK.—Both Ethyl Corp. and Du Pont announced price reductions amounting to 2.5 per cent in the per pound price of their tetraethyl lead antiknock compounds last week.

It was the second such price reduction this year for Du Pont and the third for Ethyl.



SEAL COATS using rubberized asphalts are thicker and more uniform than those obtained without additives.



RESURFACING BY FEATHEREDGING is much more durable when rubberized asphalts are used. The outside lane was featheredged on the existing pavement using Rubarite additive in the asphalt.

New Asphalt Markets Looming

G. L. Farrar

TULSA. — Refiners may soon find new markets for asphalts as paving materials.

Tests show that addition of 4 to 12 per cent by weight of Rubarite, a new asphalt additive composed of synthetic rubber and barites ($BaSO_4$), greatly improves the properties of asphalt as a road-building material. This development may lead to even wider usage of asphaltic concrete in highway construction.

Initial cost of the rubberized asphalt is somewhat higher than asphalt alone. However, it is estimated that due to longer life and lower maintenance costs over-all costs of roads using the additive will be lower.

These claims are currently being substantiated by tests on a number of U. S. highways, says H. B. Pullar, president of Rubarite, Inc., Chicago. This firm is handling the manufacture and sales of the new product *(The Oil and Gas Journal, August 10, 1953, page 69).*

Test installations of asphalt paving using Rubarite additive have been made on Madison Avenue in Kansas City, on Pike Avenue in North Little Rock, Ark., on U. S. Highway 41 between Chicago and Milwaukee, and many others. The material has stood up well after as much as 4 years of use, Pullar said.

Test results . . . Exhaustive tests clearly point up the advantages of using rubberized asphalt paving, says Walter F. Winters, Rubarite's chief engineer. Results of these tests show:

. . . The tendency of asphalt pavements to soften at high temperatures is reduced to one-half when as little as 10 per cent Rubarite is mixed with certain paving-grade asphalts. This means less pushing and shoving of pavements in the summertime.

. . . The flexibility or ductility of asphalts during cold weather is increased in some cases by as much as 100 per cent. The strength or toughness of the asphalt is increased 8 to 10 times, and the adhesion is materially increased. These improvements point to increased life, reduced maintenance costs, and fewer pavement failures.

. . . Some deficiencies, such as cracking which occurs at times on asphaltic overlays or resurfacing of concrete pavements where the cracks from the pavements "come through" the asphalt resurface, are also reduced materially. For example, a Rubarite asphalt resurfacing project in Rapid City, S. D., showed about one-tenth of the cracking as compared to a similar resurface job without rubber, after having gone through a typical South Dakota winter.

Other improvements are noted in this type of work. The unusual strength and adhesion of the rubberized asphalt allows the use of somewhat inferior stone or gravel, thereby saving considerable road funds, since these materials are often available near a project.

Relatively thin courses of resurfacing such as featheredging tend to stick and last longer. This type of construction is often necessary on city streets where grades change rapidly at intersections. A rubberized job on Ninety-second Street in Chicago which was featheredged on brick pavement stayed in place while an adjacent lane of regular asphaltic mix peeled back.

The tests also revealed:

. . . Asphalt highways containing rubber are much less slippery in wet weather. There is a greater coefficient of friction between the asphalt and the tire, and increased skid resistance is also brought about by better retention of the aggregate in the road covering.

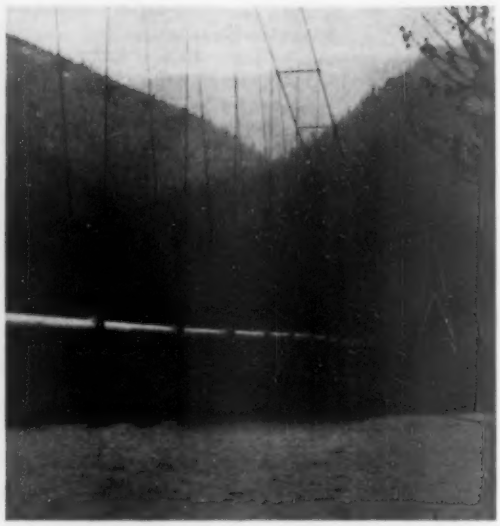
. . . In seal-coat application rubberized asphalt coats have been almost twice as thick as the untreated asphalt projects and have greater toughness and flexibility. In seal-coat work, a thin coat of asphalt is spread over the pavement to be treated, and a thin coat of stone or gravel is spread over it and rolled in place.

. . . Rubberized asphalt has also been used successfully as a crack and joint filler, as an adhesive for traffic markers, and as waterproofing for bridges, culverts, and other damp spots.

What it is . . . Rubarite is a mixture of 75 per cent by weight of butadiene-styrene synthetic rubber and 25 per cent by weight of barites, or barium sulfate. It is a fine-grained, gray, free-flowing powder. Rubber particles are approximately 1 micron in size, and barite particle size varies from 5 to 10 microns.

The additive is available in 50-lb. sacks which the highway builder handles much as he would handle sacks of cement. The material is quickly and easily mixed.

PLOWING THROUGH MUD, this tractor with a side boom strings pipe in the Idaho Panhandle—just 100 ft. off a main highway. Yellowstone crews encountered marshland just beyond that reminded them of Louisiana.



CROSSING RIVERS was just part of the job. This Clark Fork River crossing in Montana is an 820-ft. span with a rigid-frame tripod tower 105 ft. high.

How Yellowstone Operates

- **New 540-mile pipeline moving first products from Rockies into Northwest's Inland Empire**

- **Line featured by valve system to control static pressure, remote and automatic controls**

F. Lawrence Resen

HOUSTON. — Inauguration of Yellowstone Pipe Line Co.'s 540-mile carrier is the first entry of pipeline products from the Rocky Mountains into the "Inland Empire."

Traversing the rugged mountain terrain and thick pine forests between Billings, Mont., and Spokane, Wash., the 10-in. line is considered one of the roughest pipeline construction projects to date in the states.

Under initial operating conditions, stations at Billings and Helena, Mont., will provide a capacity of approximately 30,000 bbl. per day. Future plans call for a maximum of five stations and an ultimate capacity of 50,000 bbl. per day. Delivery points are located at Bozeman, Helena, and Missoula, Mont., and Spokane. Six distribution terminals provide 890,000 bbl. of storage for receiving Yellowstone deliveries.

Considerable differences in elevation—highest point was 6,325 ft. at McDonald Pass, with two other passes at 6,000 and 5,100 ft.—and other unusual conditions called for special provisions in the design and construction of the line. For instance:

... **High static pressure** exists at Spokane when the line is shut down. This pressure varies between 1,300 and 1,500 psi., depending on the product in the line. It was necessary to install two throttle valves in parallel at Spokane to maintain line pack during starting and running operations.

During startups, to keep from pulling the stream apart but still get it moving, a high-pressure, low-flow throttle valve is in control. The other valve, which has a high-flow and comparatively low-drop characteristic, takes over control as soon as it has been definitely established that pumping has started at an upstream station. From then on the valve maintains about 500-600 psi. back pressure at the Spokane end.

... **Block valves** were installed in the main line at about 25-mile intervals to allow isolation of line sections and prevent drainage in case of a break.

... **River crossings** included 9 major and more than 25 minor crossings. Two of the major crossings were under water, while the other seven were overhead crossings of a new design by Clear Span Engineering Co., Houston *(The Oil and Gas Journal, July 17, page 100)*. This design featured a rigid-frame tripod tower which expedited the erection of the crossings.

... **Cathodic protection** was an especially important part of the planning because the line parallels an electric railroad for a considerable distance. Rectifiers are being used along with sacrificial anodes to provide extensive protection.

... **Remote and automatic controls** are features of the entire line's operation, with the first remote controls on the feeder lines from the Continental Oil Co. and Carter Oil Co. refineries at Billings. Products are delivered to the Billings pump station through 8-in. transfer lines by booster stations at the two plants. These booster stations are operated remotely from the Billings station control room through supervisory controls. Switching of the refinery manifold is also accomplished from the station control room.

The two transfer lines lead to a manifold at the main station. Switching between the lines is provided by motor-operated valves controlled by the station console.

... **Pumping units** at the Billings station consist of three 500 hp. and one 200 hp. Westinghouse electric motors driving Byron Jackson pumps—two 6-stage and two 4-stage. The pumps are equipped with different size impellers to obtain a maximum number of combinations of units to reduce throttling when the various products are being pumped.

... **A starting sequence,** initiated by the control console in the main pump

station, is used to place the units on the line. This sequence allows the equipment to be placed on the line in the safest and most efficient manner, and allows operation of the station with a minimum of attendance.

All products moving into the line are filtered through Thornhill-Craver self-cleaning, jet-type strainers, equipped with 200-mesh screen. An automatic sequence to accomplish this cleaning has been provided which helps keep the operating force at a minimum. All products are delivered to the line through a battery of meters at the station and the combined meter reading is delivered to a dual printer-head in the control room.

... **Delivery facilities** are designed to remove products from the line through either a "heart cut" or by taking the entire line stream into the delivery point. Throttle valves with flow controllers maintain a packed line at all times. The self-cleaning strainers and meters are also used at the delivery facilities. Separate headers for oils and gasolines assure a separation of products and eliminate contamination.

... **Instrumentation** of the Billings station is primarily electrical, and all indicating and recording information is transmitted electrically. Foxboro equipment has been used to provide the following controls and records: (1) suction and discharge pressure controllers regulate station throttle valve, with an overriding kilowatt-demand controller to maintain a low demand on start-ups; (2) a temperature recorder is used to maintain an accurate record of the temperature of the products entering the line; (3) a flow recorder maintains continuous record of the rate-of-flow; (4) a capacitance recorder also is being used to facilitate batch switching in the manifold of the two transfer lines; and (5) pressures are measured by SR4 strain-gage pressure cells and will be electrically transmitted to gages on the control console.

The $20½ million line is jointly-owned: 40 per cent by Continental, 40 per cent by Interstate Oil Pipe Line Co., 14 per cent by Union Oil Co. of California, and 6 per cent by Husky Oil Co.

Continental Pipe Line, Conoco subsidiary, supervised construction of the line. Contractors included Associated Pipe Line Contractors, Inc., Ross & Powers, Eastern Pipe Line Field Service Co., and Engineers Limited Pipe Line Co.

Steel Pricing Revised

DALLAS.—Oil Well Supply Division of United States Steel Corp. will carry a selected stock of oil-country tubular goods in "in-transit" storage at selected barge terminals with carload prices based on "at mill" prices plus the 500-ton barge rate from shipping point to the barge terminal and an added 4 per cent of the "at mill" carload price.

Consumer delivered price for carload quantities will be based on this price, plus published rail or truck freight rates from barge terminal to destination.

Consumer Is Target

New committee to sell gas story to consuming public

NEW YORK.—Oil and gas men have been telling each other for months that the consuming public will be the loser if the federal Government controls the natural-gas industry. Now they've started to tell the consumer.

L. F. McCollum, president of Continental Oil Co., and Paul Kayser, president of El Paso Natural Gas Co., have been two of the most vocal among industry leaders who have insisted the consumer must be told the industry's side of the story. Last week the two men headed a new committee designed for that purpose. McCollum is chairman and Kayser vice chairman. Baird H. Markham, former director of the American Petroleum Industries Committee, will be full-time director.

The new committee will help smooth the way of a general gas committee formed at San Antonio last month to draft legislation to remove natural-gas producers and gatherers from the grasp of federal control. *(The Oil and Gas Journal, October 11, page 111).*

While McCollum didn't say so last week, he believes any effort to amend the Natural Gas Act to exempt the producer from Federal Power Commission authority will be a rough road to travel without public support. He thinks the industry can have that support if the consumer is convinced FPC control won't mean a smaller gas bill each month. McCollum, Kayser, and others say the consumer will suffer in the long run because federal control will destroy the incentive to discover new gas reserves.

The new committee will do its selling job from headquarters in the Empire State building here.

Industry Briefs

DENVER. — Stockholders of Colorado Oil & Gas Corp., Denver, and Derby Oil Co., Wichita, have approved an agreement to merge the two companies with Colorado Oil & Gas Corp. Colorado has formed a wholly owned subsidiary, Derby Refining Co., which will operate the refinery and marketing facilities of Derby Oil Co.

AUSTIN, Tex.—Texas gas producers will be required to report semiannual shut-in pressure adjustments of gas-well potentials on a new form, Form GWT-4, as of December 1, the Texas Railroad Commission revealed last week. These reports in the past have been submitted on Form GWT-1, which was not designed for this purpose. The commission said it is believed that the new form will save time for both itself and the operators.

CALGARY.—Husky Oil & Refining, Ltd., Calgary, has purchased Riverlake Oils, Ltd., operator of a 4,000-bbl. refinery at Fort William, Ont. Husky announced plans for expanding the refinery's capacity to 5,000 bbl. per day and installation of a Platformer and diesel desulfurizer.

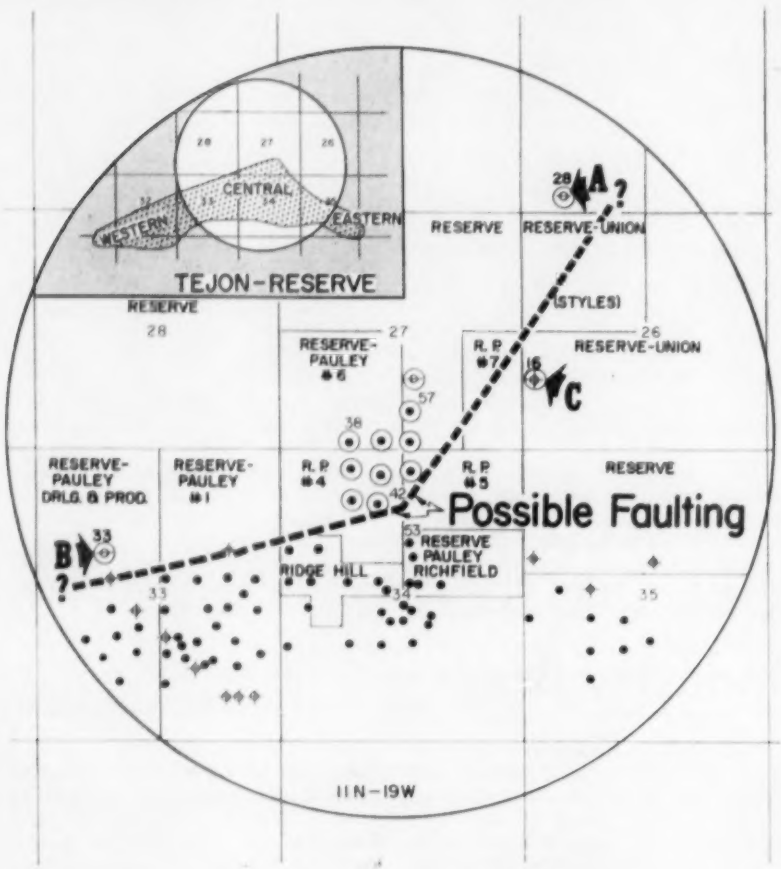
WICHITA.—The State Corporation Commission has set the Kansas allowable for crude production this month at 325,000 bbl. daily, unchanged from the October allowable.

BARTLESVILLE, Okla. — Work started last week on a five-story annex to the Cities Service Oil Co. building here. S. B. Irelan, Cities Service president, said the company will hold a long-term lease on the new structure, scheduled to be completed in mid-1955.

RAYNE, La.—Deliveries of natural gas started last week through the 1,160-mile pipeline system recently completed by Gulf Interstate Gas Co. The transmission system includes a 30-in., 845-mile main line from here to a point near Ashland, Ky. It has a daily capacity of 375 million cu. ft. of gas.

ODESSA, Tex.—Thirty-four students —some of them from as far away as Chile and Germany—have enrolled in the School of Drilling Technology which opened recently at Odessa College. The school is sponsored by the American Association of Oilwell Drilling Contractors and the Petroleum Extension Service in cooperation with Odessa College.

BARTLESVILLE, Okla. — Phillips Petroleum Co. has acquired all the capital stock of Curry Chemical Co., Inc., and 14 affiliated companies. The Curry companies engage in the wholesale and retail distribution of agricultural ammonia as well as the manufacture and distribution of mixed fertilizers.



Tejon Prospects Bright

Attention in San Joaquin Valley field focused on two key wildcats; success would extend field to over 1,200 acres

D. H. Stormont

BAKERSFIELD, Calif.—The Olcese-sand discovery scored by Reserve Oil & Gas Co. on its large Tejon Ranch lease in extreme southern San Joaquin Valley last May is giving promise of being the most important ever registered in the area.

Two 1-mile outposts will do much to ascertain whether the 5,600-ft. pool will be of major proportions. If both are successful, the productive area will probably exceed 1,200 acres. Even if both miss, a pool of some 400 acres is in prospect.

The two key wells are Reserve 28-23 in SW SW 23-11n-19w (A on map), and Drilling & Production Co. 33-33 J.V. in SE NW Sec. 33 (B on map).

The 28-23 Reserve reached a total depth of 5,824 ft. Thursday. Ditch samples indicated the Olcese sand has been encountered, but hopes of oil production were not too favorable. However, operators are preparing to run an electric log.

The key well, a 1-mile step out, was drilling below 1,500 ft. last week.

This activity, which is located about 40 miles south of here, was touched off by successful completion of 42 Reserve-Pauley in NE NW 34-11n-19w. Eight producers have since been completed on 10-acre spacing. All are flowing 30°-gravity crude at a 200-bbl. daily rate through restricted chokes in conformance with M.E.R. criteria.

In other activity in the field, Union Oil Co. abandoned its 16-26 Reserve-Union (C on map), late last week as a dry hole after reaching a depth of 6,946 ft. This well is ½ mile east of production.

Early activity . . . First oil discovery in this area was in 1936, when production from the 4,400-ft. Reserve sand (lower upper Miocene) was established in the central area. Little work was carried out until after Richfield Oil Corp. in late 1943 opened 1,800 to 2,600-ft. Chanac production in Section 33. Then in December 1945, British-American Oil Producing Co. discovered Chanac-Santa Margarita production (upper Miocene) at a depth of 2,650 ft. in the western area.

First of the series of discoveries paralleling—and apparently controlled by—the Springs fault in the Tejon Hills area occurred in July 1948. Santa Margarita production was first found at a depth of 400 ft. Later Olcese sands proved productive at about 1,250 ft., and then the Tecuya (Oligocene) sand was opened at approximately 1,700 ft.

At the first of the year, 211 wells in the 5-mile long Tejon Hills trend were producing 3,400 bbl. daily. Tejon Hills is approximately 2½ miles east of Tejon Ranch. Tejon Ranch pools, with 115 wells, had a combined output of 2,600 bbl. daily.

The three areas comprising the Tejon Ranch field extend over an east-west distance of about 4½ miles. They are believed to be separated either by faulting or synclinal troughs. Structure of the western pool is domelike, with about 100 ft. of closure. That of the central area is a northwest dipping anticlinal nose complicated by faulting. Oil accumulation in the eastern pool is controlled by faulting on a north-west dipping homoclinal structure.

The Olcese find . . . Until 42 Reserve-Pauley was staked, no tests had been made of deeper-pay possibilities along the northern flank of the central pool. Its successful completion and subsequent development showed the existence of a faulted anticlinal nose, separate from the earlier shallow development. Regional dip is to the northwest.

Formation tops encountered by the discovery were: Santa Margarita, 2,675 ft.; Fruitvale shale, 3,958 ft.; Valv. Californica (middle Miocene), 5,115 ft.; and Olcese sand, 5,657 ft. The northernmost producer, 57 Reserve, topped the Olcese at 5,568 ft. and was completed through perforations at 5,605-5,701 ft. Its surface elevation was about 30 ft. below that of the discovery well.

Upon completion of 42 Reserve-Pauley, Richfield drilled 53 Reserve as a southeast offset. Finding the pay missing, two redrill jobs were performed before the well was completed as a small producer in a separate fault block.

THIS RIG IS DRILLING one of the key wells in Tejon Ranch. It is below 1,500 ft. on Drilling & Production Co. 33-33 J.V. (B on map).

Another well to miss the new pay is the well abandoned by Union in Section 26. No faults are known to have been encountered, but faulting such as that shown on the accompanying map may be present.

Maximum pay interval encountered by any of the nine completed wells has been 170 ft., with the average running slightly less than 100 ft. All have found free gas in the shale section overlying the oil sand. In 38 Reserve-Pauley, the most recent and structurally lowest well completed, the gas was largely found to be displaced by oil. Only minor shale breaks are present in the regular oil sand.

Formation data considered in assigning a M.E.R. of 200 bbl. to these wells included: productivity index, 1.5; formation volume factor, 1.49; solution gas-oil ratio, 712 cu. ft. per bbl.; and a 180 psi. drawdown. Produced gas-oil ratios, exclusive of free gas from the gas cap, average about 400 cu. ft. per bbl. The 200 bbl. per well output of 30°-gravity crude being maintained is largely obtained through 11/64-in. chokes.

Union's Crude, Products Up

LOS ANGELES.—Union Oil Co. of California reported its sales of crude oil and products in the 9 months ended September 30 rose to 53,747,976 bbl. from 47,457,871 bbl. in the like 1953 period.

Refinery runs increased from 38,803,283 to 40,611,983 in 1953. Expenditures for property additions and replacements totaled $60,197,226 in the first three quarters of this year, a jump from 53,524,591 a year ago.

Harbor Subsidence Forecast

LONG BEACH.—Portions of the harbor area here will sink 30 ft. if drilling operations are extended and no steps are taken to repressurize depleted zones.

The city council learned this last week when Dr. G. D. McCann and Dr. C. H. Wilts, of California Institute of Technology, presented a recent report on studies they have made.

The report showed that 20 ft. of subsidence had already occurred and that 24 ft. would be attained even if present operations are not extended. Richfield Oil Corp. had previously filed a report predicting an ultimate drop of 35 ft. at the center. Richfield also forecast a 4-ft. drop at Belmont Shore and a 3½-ft. drop in the Naples area if drilling activity is expanded eastward.

Richfield and Long Beach Development Co., the city's contract operators in the Bar Harbor area, have gas and water injection programs started, but all are in the pilot stage and the remedial effects in reducing subsidence can not be determined.

Superior In City Leasing

LONG BEACH.—Superior Oil Co., Los Angeles independent producer, is the second company involved in the lease play for about 800 acres of urban Long Beach land.

Richfield Oil Corp. disclosed several weeks ago that it has leased more than 500 acres of the area *(The Oil and Gas Journal, October 4, page 117)*. Superior has acquired leases on about 75 acres of the area. This leaves some 200 acres still unleased in the area bounded on the west by Pine Avenue, on the south by the ocean, and on the southeast by a line from 10th Street and Pine to Molino Avenue.

Refinery Move Suggested

WASHINGTON.—Moving Los Angeles refineries to the Mojave Desert to remedy California's smog problem and bolster national security has been suggested to the Office of Defense Mobilization.

The billion-dollar expense involved in the operation of moving the refining industry 100 miles east, however, is recognized here as impractical.

The idea reportedly was developed by non-oil interests in Los Angeles and submitted to ODM through George F. Meredith, onetime director of the Senate small business committee and now a Los Angeles business relations consultant.

ODM concern with the West Coast at the moment is directed toward wartime supply and a committee is being set up to make a study of the availability of crude and products in case of war. This committee is expected to be headed by Charles A. Thomas, president of Monsanto Chemical Co.

Big Spending to Continue

SAN FRANCISCO.—Ready to wind up 1954 with a record expenditure of $275 millions, R. G. Follis, board chairman of Standard Oil Co. of California, indicated last week his company plans to spend that much or more in 1955.

Follis said he anticipates a total expenditure this year of $50 million more than the company spent in 1953 and added, "We contemplate a very high level of expenditures again in 1955. Although our budgeting for next year has not yet been completed, it is expected we will make investments for capital and exploratory purposes at a rate equal to or exceeding the current year's program."

Catching the Vapors

From the refinery right down to the gas nozzle, California's oil industry is battling to control air pollution and avoid the blame for the West Coast's smog nuisance. This vapor control system on a filling spout has a tapered black neoprene collar which fits snugly into the well of the tank trunk forming a vapor-tight seal. Vapor pushed out of the tank as the gasoline enters is drawn off through the flexible hose on the left of the fill spot. General Petroleum Corp. is installing the first of the new systems, which will cost more than $1,000,000.

Geology's Future Mapped

Jersey Standard's Weeks tells Gulf Coast meeting oil and the atom will be 'economic partners' more than competitors

Frank J. Gardner

HOUSTON.—The geologist of the future must be alert, bold, shrewd, and aggressive.

This pattern for geology in the future was outlined by L. G. Weeks, chief geologist for Standard Oil Co. (N.J.), before 2,000 petroleum geologists assembled in Houston's Rice Hotel last week for the fourth annual meeting of the Gulf Coast Association of Geological Societies.

"Those responsible for finding enough liquid energy for future America and for future mankind elsewhere on the globe obviously have their work cut out for them. They will have to be alert every moment to new techniques, increasingly bold in their searches, and increasingly shrewd in the evaluation of evidence. They also will need . . . to be increasingly aggressive as salesmen of their beliefs."

Keynoting the meeting with an optimistic outline of the geologist's future role in supplying the world's energy requirements, Weeks held a figurative crystal ball before his audience. Step by step, he traced the energy uses from primitive time and projected it forward as far as the year 2050, well into the atomic era.

Weeks also reviewed the role geologists have played in the past—and the spot they will occupy in the future.

The coal-petroleum "moment" . . . The speaker reminded his listeners that Dr. M. King Hubbert, using existing estimates of potential coal and petroleum reserves in the world, has shown that the present period of fossil fuels will represent "but a moment" in the total of human history.

"Just how long this coal-petroleum 'moment' will be depends upon the total supply and the rate of use . . . In our time, acceleration in the rate of use . . . has been almost greater than a person cares to believe. Something like 92 billion metric tons of coal have been burned in the past 700 years. Yet, so huge an amount is only 57 years' world supply at the present rate of use. Approximately half of all the coal produced to date . . . has been mined since 1925, and 80 per cent since 1900.

"Though petroleum was known to the ancients, its extensive . . . utilization began . . . only about 100 years ago. The rate of growth in its use is even more spectacular than that of coal."

One of the great lessons of history, Weeks pointed out, is that great increases in the demand for energy and great increases in world population go hand in hand. He said world population has doubled in the past 100 years. If present rates of increase are maintained, it will double again in the next 85 years.

The American petroleum geologists, according to Weeks, probably have done more than any other group of similar size to raise living standards of people the world over.

Weeks said geological searches "have formed the basis for a revolution in transportation, in heating, and for a host of synthetic materials touching upon every phase of life.

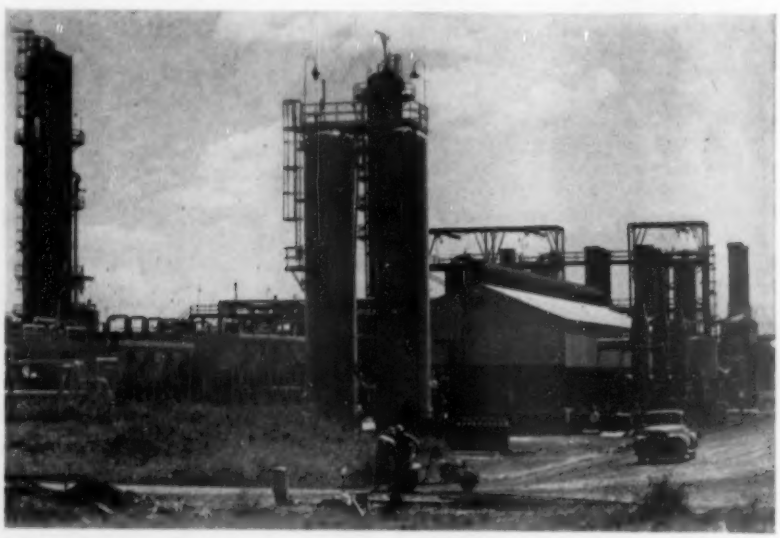
"And the end is nowhere in sight. . . . Looking down the long road at future energy requirements and the provision of supplies to meet them, his role appears even more important than in the past."

Oil and the atom . . . Weeks then referred to Palmer Putnam's recent statement that there is little prospect that nonnuclear energy sources other than coal and petroleum will supply more than 7 to 15 per cent of demand in the United States by the year 2050.

"It appears now that oil and the atom will be economic partners. We already know of many important ways in which they may supplement and aid each other. They will probably do this more than they will compete.

"The considered opinion of some experts based on present knowledge is that fission of uranium and thorium will not support more than 20 per cent of the energy system of the United States as now patterned. However, there appears to be no doubt that atomic power will be adapted for many of the purposes now served by oil, water power, and coal. Its first main use will probably be in the generation of electric power, for which purpose only 3 per cent of our oil consumption is used today. In any event, oil consumption is conservatively estimated at 13 million barrels by 1975, 70 per cent higher than at present."

Weeks thinks costs will, as always,



Phillips Puts Platformer on Stream at Sweeny

Phillips Petroleum Co. has recently gone on stream at Sweeny, Tex., with this 16,000-bbl. Platformer. The unit features extensive use of automatic controls, continuous maintenance equipment for maximum on stream efficiency, and the use of air-fin coolers and radiant heaters to keep utility requirements to a minimum. The field construction of the unit began January 15, 1954. Construction was completed in 9 months and 14 days, record time for this size of unit. Universal Oil Products Co., of Des Plaines, Ill., designed and licensed the Platformer, and Procon, Inc., constructed it.

be a decisive factor and indications as of today are that those for atomic power will be high compared to the cost of present fuels. A major problem in the industrial use of atomic energy will be that of safe disposal of the great amounts of radioactivity produced. Distribution will be another.

"As yet, there is no assurance that atomic energy can be widely distributed in convenient-sized packages," he added.

The long view . . . In climaxing his address, Weeks pointed to the fact that since nothing can be logically considered a reserve unless it can be produced and used profitably, it should be remembered that practically none of our present-day energy reserves was always such.

"It is well to remember, also, that nothing is a resource unless it is used. . . . The key to resources is science . . . and one of the master keys is geology.

"The geologist is by nature a long-time operator, and, surely, one thing needed today is thinking and planning for the long view. . . . He thinks in terms of many years. . . . So far as energy supply is concerned, he knows that questions of substitute sources will work themselves out. Meanwhile, he knows that for many years to come, he will have to keep on leading the way to additional supplies of oil energy, in greater volume than in the past."

"Mr. Gus" Test Planned

Giant mobile platform on lease to Shell will be used in drilling wildcat in 50 ft. of water for four-company unit

BEAUMONT.—"Mr. Gus," unveiled last week as the latest and biggest mobile drilling platform, will test its sea legs drilling a four-company wildcat in 50 ft. of water 17 miles east of Freeport, Tex.

The platform, designed to drill in depths up to 100 ft., was launched here at Bethlehem Steel Co.'s shipyard for C. G. Glasscock Drilling Co. of Corpus Christi. Shell Oil Co. has contracted with Glasscock for the unit, and it will be towed down the Neches River and Port Arthur Canal through the Sabine Pass into the Gulf next week.

Shell revealed last week the unit's first test will be on a joint venture wildcat on State Tract 249 in which Pure Oil Co., Humble Oil & Refining Co., and Ohio Oil Co. will participate.

The twin-hull mobile platform consists of two separate units, one containing the drilling platform and derrick and the other serving as a working platform. It is extremely flexible and can drill in water as shallow as 20 ft. or as deep as 100 ft.

Completely different from anything yet devised for offshore drilling, it provides the mobility of a regular shallow-water barge and also the stability of a fixed template-type structure.

How it works . . . The unit drops its own "built-in" piling to the ocean floor, forcing it into the silt by hydraulic jacks which raise the hull on pairs of diagonally opposite piles at a time. When the desired depth is reached, the upper hull is clamped to the piling. The lower hull is submerged by flooding with sea water and exerting pressure on it with the 5-ft. access caissons through which men descend to clamp the lower hull to the piling sunk into the ocean floor.

To move the platform, the procedure is reversed and the jacks are used to pull the piling.

Pipeline Goes To Sea

World's longest submarine line one-third completed

MORGAN CITY, La.—The world's longest submarine pipeline last week had snaked its way 17 miles seaward from Burns Terminal on its 48-mile dog-leg route to the most distant production yet found on the Continental Shelf.

Brown & Root Construction Co., Houston, completed the first phase of construction on the 12-in. line to production 25 miles offshore. Magnolia Petroleum Co., Continental Oil Co., and Newmont Oil Co. jointly own the production. The line will extend from the terminal through the Eugene Island oil and gas area and to the Block 126 oil field *(The Oil and Gas Journal, August 13, page 97)*.

The 27-mile portion from the terminal to Eugene Island will be completed this year and the remainder finished early next summer. Magnolia will operate the system for the group.

The new line will have a capacity of about 50,000 bbl. daily—about 10 times what the Magnolia-Continental-Newmont team is now producing. Weather conditions and interruptions in barging operations have held production under present allowables. The line will probably have an initial throughput of 10,000 bbl. daily.

Marchand to Expand

Calco plans more drilling; drops aerial tramway idea

LEEVILLE, La.—The California Co. plans to drill at least 16 more wells in Bay Marchand field, but the company is abandoning plans for a $1,500,000 aerial tramway to transport personnel to and from production platforms in the big underwater oil field.

Calco is building two new offshore structures for the development drilling program. One will accommodate 10 wells to be drilled by conventional rigs. The other will be a six-well platform for a multiple-well rig like those Calco is using at Main Pass.

The field, the largest offshore, now has 50 producing wells with an output of about 7,800 bbl. daily.

A Calco spokesman said last week the aerial tramway proposed several months ago would be "uneconomic." A study revealed that the system of towers supporting a rail 36 ft. above water would have saved boat trips and could operate in any kind of weather, but it would not completely eliminate the need for a fleet of boats.

The company said that its LST "S-21" had moved into a Gulf Coast shipyard for its annual overhaul and inspection after having drilled 21 wells at Bay Marchand during the past 12 months. It is to be replaced by a newly converted LST.

Pipe Mill Closed

Delay in big gas line cited as major factor

HOUSTON. — A. O. Smith Corp. confirmed reports last week that it has temporarily closed its Houston pipe mill.

The company revealed it had shut down the mill because there was not enough backlog of orders. Delay in construction of the proposed American Louisiana Pipe Line Co. 1,300-mile natural-gas line from North Tepetate, La., to Bridgman and Detroit, Mich., was said to have the "greatest bearing" on the decision to shut down the mill.

The Federal Power Commission has approved the American Louisiana line, but construction cannot begin until independent producers who will supply the gas have applied for and obtained authorization from FPC.

A spokesman for Smith said the company will fill its orders for tubular goods out of Milwaukee, while the plant here is closed.

"We hope to start up again as soon as we get some more orders," he said.

Tioga Plant Finished

Signal puts North Dakota's first natural-gasoline plant on stream; dry gas still is center of pipeline controversy

TIOGA, N. D.—Signal Oil & Gas Co., a veteran of the natural-gasoline industry dating back to the firm's founding at Signal Hill field in California in 1922, has placed its new plant on stream here.

The residue gas, now being flared, may be the key to a pipeline fight which has been going on in North Dakota.

North Dakota Natural Gas Transmission Co. and Northern Natural Gas Co. both plan lines from Tioga to Fargo and Grand Forks and other smaller communities in North Dakota.

North Dakota Natural has a contract with Amerada Petroleum Corp., which owns the bulk of casinghead gas produced in the Tioga area. However, the North Dakota Public Service Commission has turned N. D. Natural's application down once and only recently did it agree to give the company another hearing on an amended application *(The Oil and Gas Journal, October 25, page 77)*.

Postponement asked . . . Northern Natural, on the other hand, has asked the commission to postpone a hearing on its case indefinitely. The Omaha company said it needed more time in its negotiations with Amerada for the same gas *(The Oil and Gas Journal, September 20, page 111)*.

Natural gasoline from the plant is being shipped through Service Pipe Line Co.'s crude line to the Mandan, N. D., refinery of Standard Oil Co. (Ind.). The L.P.G. is being marketed by Signal Perfect Fuels, Inc., in North Dakota and adjoining states.

J. F. Pritchard & Co. engineered the plant, and Brown & Root, Inc., did the construction. The plant will process about 35,000,000 cu. ft. of gas daily, and contains a hydrogen sulfide plant to purify the gas.

Another plant . . . Signal also has completed a natural-gasoline plant in Carter County, Oklahoma, serving Fox, North Fox, Milroy, Southern Scholem Alechem, Graham, Wheeler, and Caddo fields.

The plant was designed and constructed by Hudson Engineering Corp., of Houston. The plant has been in operation for only a few days and has been processing approximately 30,000,000 cu. ft. of gas per day. From this amount, the plant has made 30,000 gal. of natural gasoline and 40,000 gal. of propane and butane.

Dakota Pool Limits Set

BISMARCK, N. D.—The Industrial Commission ordered 40-acre spacing for a period of 18 months for development of the Belfield Heath pool opened by Amerada Petroleum Corp.'s 1 R. E. Newton, NW SW 31-140n-99w, Stark County.

Limits of the pool were set at Section 1 of 139n-100w, the S½ of 25 and all of 36 in 140n-100w, in Billings County, and 6-139n-99w, S½ of 30 and all of 31 in 140n-99w, Stark County.

Montana Field Extended

BILLINGS, Mont.—The largest and fastest-growing oil field in central Montana, Northwest Sumatra, has an apparent successful extension at McAlester Fuel Co. 1-B Grebe, Rosebud County.

The operator has perforated the bottom 30 ft. of an 80 ft. pay zone. This indicated strike is about ½ mile from dry holes to the west and southeast. It is likely that the discovery is on a separate feature from the main field area to the west.

Northwest Sumatra was opened in 1952 at The Texas Co. 1 Grebe. Initial production was 283 bbl. of oil per day flowing. Most operators believe the pay in the field to be upper Heath, although the discovery well was considered to be lower Amsden sand.

The field has 37 producers with a daily production of 2,000 bbl. The producing area extends more than 4 miles east and west, 1 mile at its widest point north and south. The field's limits cannot be defined due to the irregularity of the scattered dry holes around it.

Pilot Flood Planned

CASPER, Wyo.—A pilot water flood in Salt Creek field, Natrona County, Wyoming, will be started in a few weeks by Midwest Oil Corp. Six water-injection wells and two producing wells will be drilled in the 1,100-ft. First Wall Creek sand.

Results obtained from the 20 acres flooded will be used to evaluate the feasibility of a fieldwide First Wall Creek flood. Lack of water in the Salt Creek area has made it necessary to drill a 4,800-ft. well to the water-bearing Madison formation.

Midwest is a unit operator in the field. Other participants in the unit are Continental Oil Co., Argo Oil Corp., The Texas Co., Sinclair Oil & Gas Co., and Utah Oil Refining Co.

40-Acre Spacing Approved

DENVER.—The Colorado Oil and Gas Commission has set standard 40-acre spacing for wells in the Cedar Creek field of Logan County and the Big Beaver field of Washington County.

British-American Oil Producing Co. requested the Cedar Creek spacing. The Big Beaver spacing order resulted from a joint request by Continental Oil Co., New Drilling Co., Shell Oil Co., and Stanolind Oil & Gas Co.

Do You KNOW

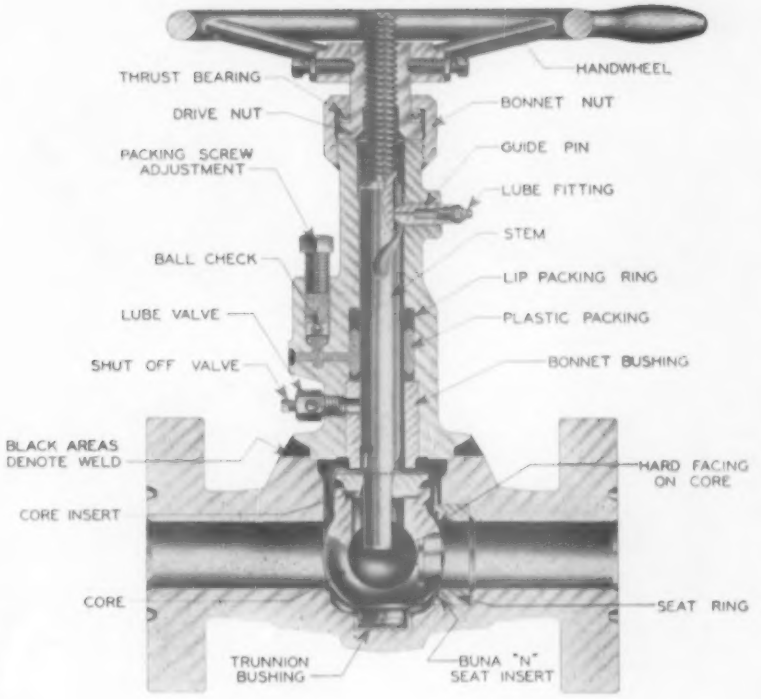


Figure No. F206-15 2" API Series 1500, Ring Joint, 3000 lbs. W.O.G. 6000 lbs. Test Pressure

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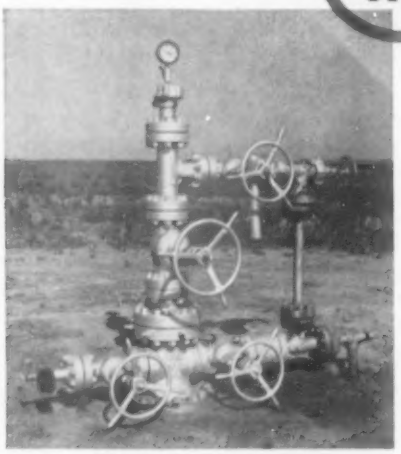

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L.P.G. Flood Approved

Railroad Commission gives Buttram go-ahead for injection of L.P.G. ahead of pilot water flood at Camp Hill field

AUSTIN.—An Oklahoma oil operator is going to inject L.P.G. ahead of water in an effort to produce highly viscous crude from a low-pressure Texas reservoir.

The Texas Railroad Commission last week gave its approval to the project which may prove to be a new method to coax oil from a field that has no commercial production. Buttram Petroleum Corp., Oklahoma City, plans the project for the 660-acre Camp Hill field southeast of Palestine, Tex., in Anderson County *(The Oil and Gas Journel, August 30, page 56)*.

The new technique involves large-scale injection of L.P.G. prior to conventional water flooding. The L.P.G., according to Frank Buttram, head of Buttram Petroleum, is expected to create a fluid front ahead of the water and bring about a more favorable permeability relationship to water and oil.

Camp Hill field has no production at present, but oil in place in the 525-ft. Carizo-Wilcox is estimated at 1,900 bbl. per acre-foot. Viscosity of the oil is 34 cp., and reservoir pressure is only 70 psi.

Buttram plans to inject not less than 10,000 bbl. of L.P.G.—about 70 per cent butane and 30 per cent propane—at a rate of about 260 bbl. daily. Fresh water would follow the L.P.G. at about the same rate.

Buttram believes that this procedure will thin down the crude, at least in the vicinity of the well bore, reduce residual or nonrecoverable oil content, and thus also reduce premature bypassing of water.

Recovery by the new flooding technique, employing a five-spot, 10-acre pilot, is estimated at about 9,000 bbl. per acre. Two existing wells will be converted to injection service. The remaining two input wells, the producer, and a water-supply well will be drilled.

Sand-up problem . . . In addition to the highly viscous oil and low reservoir pressure, Buttram has a third problem at Camp Hill field—that of the loose unconsolidated nature of the pay sand.

He proposes to whip this by using a new venturi-jet pump, to which he claims exclusive rights. The pump, which has already been tested on one of the existing wells, will not sand up or cut out easily, according to Buttram.

The Oklahoman is convinced that the pump would work efficiently if there were sufficient reservoir energy to push the oil to the well bore.

Welch Flood Sought

San Andres water flooding proposed by Cities Service

AUSTIN.—Cities Service Oil Co. expects to recover an additional 1,644,000 bbl. of oil by a water flood planned for the San Andres in Welch field, Dawson County, West Texas.

In its application to the Texas Railroad Commission last week, Cities Service said the project would be conducted in the 4,860-ft. San Andres underlying its 560-acre Kirkpatrick lease. Welch field, with a productive area of about 7,680 acres, was discovered in 1938. Production under the Kirkpatrick lease was established later in 1947 but is considered settled. There are 14 wells on the lease—9 of them regarded as marginal producers. Average daily production per well is about 14 bbl.

Cities Service plans to convert four of these producers to input wells and to inject about 400 to 600 bbl. of water daily through each at a pressure of about 1,000 psi. Salt water obtained from the Fusselman at 11,960 ft. will be injected through a closed-type system and with a 40-acre, five-spot injection pattern.

The company estimated original oil in place at 21,000,000 bbl. and residual oil saturation at abandonment at 73 per cent of pore space.

R. E. Adams, spokesman for the company, described the San Andres reservoir in Welch field, a dolomite pay, as a terrace-type structure defined by a pinchout of porosity. He said there has never been a gas cap. Reservoir drive is solution gas.

Water-Flood Permit Asked

AUSTIN. — American Trading & Production Corp., Midland, Tex., is seeking Texas Railroad Commission approval of a pilot water flood of the McMillan sand underlying its Lindemann field properties in Runnels County, West Texas.

The pilot, if successful, would be expanded to a full-scale flood later from which additional oil recovery might total 1,000,000 bbl., the company told a commission examiner at a hearing on the project last week.

Produced salt water plus some from the 1,200-ft. Coleman Junction formation would be injected into the 2,475-88-ft. zone through the initial single input well on a 20-acre pattern. Injection volume would be about 500 to 750 bbl. of water daily at a pressure of up to 100 psi.

Cumulative production from the lease, on which there are 11 wells producing an average of 26 bbl. daily each, is approximately 285,000 bbl. The first well on the lease was completed in March 1952.

American Trading & Production asked permission to expand the project without another hearing.

Gasoline Plant Operating

SEMINOLE, Tex.—Cities Service Oil Co., as operator, has placed on stream a new natural-gasoline plant in West Seminole field 5 miles northwest of here in Gaines County, West Texas.

The plant is designed to process 21,000,000 cu. ft. of gas daily at capacity operation from West Seminole and Russell fields.

Owners of the plant include Cities Service, Atlantic Refining Co., Burdell Oil Co., Magnolia Petroleum Co., Superior Oil Co., Sinclair Oil & Gas Co., Shell Oil Co., and Great Western Drilling Co.

Guy W. Duren, Jr., Blackwell, Okla., is superintendent.

Tax Rulings Made

AUSTIN.—Under a new ruling by the Texas Supreme Court, sulfur extracted from natural gas is subject to the same taxes as that produced through conventional mining. The court refused Phillips Chemical Co.'s petition to set aside a ruling of the Austin Civil Court of Appeals, which held gas-derived sulfur to be taxable.

On related subject, John Ben Sheppard, Texas attorney general, has ruled the condensate separated from gas is subject to taxation at its full market value. If condensate is not extracted, the wet gas is taxable only at its market value as a gas.

Refinery Units Canceled

Many tax write-offs approved for oil and gas facilities have been voided, survey by government agency reveals

WASHINGTON.—Twenty-six refinery projects with a proposed total capacity of 125,000 bbl. daily have been canceled after being approved for accelerated tax amortization.

The Oil and Gas Division revealed that $540,000,000 of the $4,650,800,000 to have been spent in petroleum-industry expansion under the fast write-off program had been withdrawn.

Canceled refinery facilities, with a total cost of $113,240,000, represent only a small percentage of the 476 basic refining projects for which the Office of Defense Mobilization had granted quick tax write-off. In all, the refining projects would have represented 1,849,000 bbl. of daily capacity and a total cost of $1,853,248,000.

Also canceled were eight projects for 4,226 miles of crude and products pipelines to cost $244,332,000, according to the OGD analysis. The survey covers projects approved for accelerated tax amortization as of September 30.

Other projects approved for accelerated amortization are listed below, together with capacity where figures are available, cost, and projects canceled:

... **Eighty-five alkylation units,** 108,000 bbl. daily capacity, $186,748,000. Ten of these projects, representing 17,000-bbl. capacity and $37,625,000 in cost, were canceled.

... **Forty-four aromatics projects,** 55,000 bbl. daily, $54,903,000. Six were canceled, reducing the totals by 10,000 bbl. and $11,148,000.

... **Seventeen projects for manufacture** of cracking catalyst, 45,000 tons monthly, $30,303,000. Only one of the projects was canceled. It represented 1,000 tons of monthly capacity and $2,000,000 in cost.

... **Fourteen lubricating-oil projects,** 9,000 bbl. daily, $51,391,000. Canceled were two units, representing 5,000 bbl. in daily capacity and $38,096,000 in total cost.

... **Twenty-three projects** for 11,000,000 lb. monthly of lube-oil additives, $26,727,000. Two were canceled, reducing the totals by 2,000,000 lb. monthly and $3,335,000.

... **Twenty-one projects** for 223,000,000 lb. per year of tetraethyl lead, $71,459,000. Three for 12,000,000 lb. annually to cost $1,437,000 were canceled.

... **Thirty-seven petrochemical projects,** $183,327,000. Three were canceled, reducing the total cost by $32,654,000.

... **One hundred eighty-one projects to process** 300,000 bbl. daily of natural gasoline, $357,337,000. Of these, 14 were canceled, reducing total capacity by 11,000 bbl. daily and total cost by $30,729,000.

... **Nineteen projects** for wet gathering of 22,000 bbl. daily of natural gasoline, $4,433,000. None was canceled.

... **Forty-seven storage projects,** including underground facilities, 5,388,000 bbl. of natural gasoline, $12,697,000. Six were canceled, representing a reduction of 440,000 bbl. and $928,000.

... **One hundred seventy-two crude and products pipelines,** 21,535 miles, $1,045,959,000. Canceled were eight projects totaling 4,226 miles and $244,332,000.

... **Seven projects** for oil-field equipment, $8,372,000. Remainder of the 45 applications for this type of project were denied.

FPC Probe Urged

Kefauver denounces policy in allowing gas-rate hikes

WASHINGTON. — A congressional investigation of Federal Power Commission policies was threatened last week after the FPC allowed natural-gas producers to raise their rates approximately $8,122,000 a year.

Sen. Estes Kefauver of Tennessee said he would ask the Senate antimonopoly subcommittee, of which he is a member, to "get the facts" next year.

Kefauver declared that as result of the commission's policy, gas rates to consumers will rise all over the country within a few months.

The FPC's action clearly illustrated that not all price increases proposed by independent natural-gas producers will be questioned under the agency's recently assumed authority to set rates charged to interstate pipelines.

In a 1-day hearing at which some 243 such proposals were considered, the commission took no action on 238 increases totaling $8,121,928 annually. It suspended for hearing and later decision only five proposed increases totaling about $2,850,000 a year. Most of the suspended increase was involved in rates to be charged by Union Oil Co. of California to the Transcontinental Gas Pipe Line Co.

Of the increases allowed by the commission, the largest involved $2,186,000 proposed by The Chicago Corp. and $1,163,000 by A. C. Glassell, Jr., et al on sales to Tennessee Gas Transmission Co.

Kefauver charged that the FPC action amounted to "a further breakdown of regulations devised to control an essentially monopolistic industry" and asserted the natural-gas producers are dominated by "a handful of oil and financial interests."

Kermac Still Waiting

Comptroller to decide if bid deposits are refunded

WASHINGTON. — Kerr-McGee Oil Industries, Inc., may get to call the whole thing off and get its $2,932,800 back, but disapproving noises from the Interior Department indicate there are those who do not think the company should be excused for its mistake.

After Kerr-McGee discovered it had bid some $15 million on tracts off Louisiana which it did not want, the company rushed to try and correct the error. Kermac said it bid on block numbers instead of the special tract numbers listed for the Government's first sale of leases on the Continental Shelf. Kermac doesn't want the nine tracts on which it accidentally made successful bids. All the company wants now is to get its money back and forget the whole thing as quickly as possible.

Whether this will happen apparently rests on Frank H. Weitzel, acting comptroller general of the United States. The Interior Department checked the problem to him and now is waiting for an answer. At first Interior said it was not bound by a decision made in Weitzel's office, but last week an undersecretary said if Weitzel thinks he has evidence of a mistake and that the mistake warrants withdrawing the bids, Interior will comply.

That wasn't the only comment made by Clarence A. Davis, the undersecretary. He wrote Weitzel that the bids as submitted were "perfect" and there was nothing "that would put the awarding officer on notice of a mistake."

"This department feels that serious questions of both fact and equity are involved in this situation," Davis continued. "It appears that the evidence

of mistake is strong, but not necessarily conclusive; that any assumed mistake was the result of gross and unilateral negligence; and finally that an award of leases on the bids as submitted would not be unconscionable."

Wage Drive Seen

Mitchell forecasts move for guaranteed annual pay

WASHINGTON. — Improvement of state unemployment compensation laws might head off a union drive for a guaranteed annual wage, industry was told last week by Secretary of Labor James P. Mitchell.

The guaranteed annual wage will become an issue in the next few years, Mitchell predicted. To the unions it is a way of offsetting the ups and downs in employment, but for employers it will be a problem for which there is no single solution that can be universally applied.

A few companies already have annual wage systems in effect, tailored to their individual circumstances, but Mitchell pointed out that such plans must depend on the nature of the business, its financial position and ability to control production to spread it out over the year. No one formula will meet all industries, he said.

Mitchell expressed the opinion that the issue is primarily one of stability of employment. He said he believes the unions, in talking about an annual wage, are really talking about supplementary unemployment compensation in one form or another.

Benefits under many state laws are definitely inadequate, the secretary said, suggesting that employers should seek to improve the state systems.

Tanker Deal Studied

WASHINGTON. — A $24,000,000 tanker construction program, the second of the "trade-in" deals authorized by Congress last session, is being worked out by the Maritime Administration and Cities Service Co.

The company will trade in five T2 tankers for credit toward the construction of two supertankers. Cities Service will build a third supertanker when two additional T2's become eligible for trade-in next April. The credit for the five T2's will total about $7,000,000. Additional expenditure by the company will be about $17,000,000.

The first trade-in deal was completed last month with Esso Shipping Co. It calls for the trade-in of five T2's for a credit of $5,000,000 on construction of two supertankers to cost $16,000,000 to $17,000,000.

WATCHING WASHINGTON

Bertram F. Linz

Change Not Drastic

No dramatic changes in the attitude of Congress toward the oil and gas industry are expected as a result of last week's elections.

There was no Democratic "landslide" which would put that party in control of Congress by a wide margin.

While the chairmanships of important committees will switch from Republicans to Democrats, a great majority of the new chairmen will be conservatives and most of them are not ill-disposed toward business.

Leadership of the House commerce committee which deals with oil and gas will pass from Rep. Charles A. Wolverton of New Jersey. Rep. J. Percy Priest of Tennessee would be in line for the new chairmanship, but he may prefer to act as Democratic whip, handing the post down to Oren Harris of Arkansas. Harris is a longtime member of the group and thoroughly familiar with oil and gas problems and, on the whole, friendly to the industry.

The narrow margin which the Democrats control will limit efforts to enact measures directed against business and industry. Members' votes will reflect back-home opinion rather than a party line on issues such as amendment of the Natural Gas Act to overcome the effects of the Phillips decision.

In one field, however, industry may find itself a target. Under Democratic leadership, there probably will be a considerable increase in investigations. Oil is a subject that can always make the front page —and the 1956 presidential campaign is little more than 18 months away.

Love Thy Neighbor

A firm effort to induce the Latin American countries to ease their laws to provide a better climate for foreign investment will be made at the special meeting of the finance and economic ministers of the inter-American states which opens in Rio de Janeiro November 20.

The effort will be directed primarily at the nationalistic natural-resource laws which have precluded American development of the oil resources of Brazil and other countries (see page 132).

It is also expected that new attention will be paid to cementing our relations with the Latin American republics, which have complained of neglect under our postwar aid programs. The Marshall Plan and other aid programs were directed at combating communism wherever it appeared most dangerous, and thus they have been confined largely to Europe and the Far East. But with the European economic situation much improved, and consequently less danger from communist subversion, more attention can be paid to the Western Hemisphere.

Evidence that the United States has not been unmindful of the nations close to home was shown recently in the aid given countries abutting Guatemala.

It is felt, however, that if technical and other assistance to Latin America is to be increased, a good starting place would be fostering an increased flow of private capital to expand development of industrial and natural resources.

Washington Watching

Monopoly and antitrust continue to get top attention in Washington.

Assistant Attorney General Stanley N. Barnes, head of the Justice Department antitrust division, said it appeared unlikely that a consent decree would be worked out in the pending oil cartel suit in New York.

The Federal Trade Commission has ordered an investigation of mergers and acquisitions to determine whether there is a pattern to a post-Korean upswing in consolidations and whether there is cause for action.

Important Republican and Democratic members of the antimonopoly subcommittee of the Senate judiciary committee disclosed they would seek a $1,000,000 appropriation in January for an all-out investigation of the effect of monopoly in a number of fields.

The small business committees of both Senate and House also are expected to undertake monopoly probes. An appeal for one such inquiry has been threatened by automobile dealers resentful of manufacturers' practices under which, they claim, they were forced to take more cars than they could sell.

Will Latin America entice . . .

. . . More Foreign Oil Money?

Dahl M. Duff

LEGAL barriers which block private oil capital out of a large part of Latin America stand a chance of being lowered in three countries.

The Chilean Government is preparing to issue an executive decree authorizing private exploration and development contracts. Guatemala has a commission working on new petroleum legislation, and Brazil may soon seek to modify the oil-monopoly Petrobras law.

A move toward more liberal and less nationalistic oil laws has been apparent in Latin America the last 2 or 3 years. Argentina, Bolivia, and Peru have invited foreign operators, though on varying terms and with different results. Heavy exploration investments are now being made in Peru by nearly a score of companies under the 1952 Peruvian petroleum law.

For a time after the war, of all the larger Latin American countries, only Venezuela and Colombia allowed exploration and development by foreign companies. Even in Venezuela new concessions have been withheld since 1945, although the country now seems ready to lower the barriers. *(The Oil and Gas Journal, October 25, page 82).* In various other countries existing legislation was framed so as to keep out the foreign operator.

The changes that have occurred have stemmed from one or more of several factors — disillusionment with the results of state oil monopolies, a recognition of the tremendous capital requirements for exploration and development, or the need for oil production to meet growing internal consumption.

Chile . . . The new oil policy in Chile represents a reversal of that announced by the government last summer *(The Oil and Gas Journal, August 9, page 83).* The executive decree will empower the state company, Empresa Nacional del Petroleo, to sign contracts with private companies for the exploration and development of new areas.

Chile currently is under state-of-seige regulations imposed by the government, and it seems unlikely any of the large oil companies will take advantage of the decree unless it receives the blessing of the Congress. Observers of the political situation in Chile say this is by no means assured.

Initial reports on the decree are that it specifies a minimum 20 per cent share for the government in each venture. The minister of mines, Armando Uribe, said private capital investments in the country's oil industry would be under bilateral contracts and that no concessions as such would be granted.

The Chilean Government was reported to have decided that the new oil policy could be carried out without special legislation. Any contracts signed with private interests would be for work outside the area in southern Chile where ENAP is operating. Reports were that the contracts would cover 100,000 hectares (247,100 acres) for exploration and 5,000 hectares (12,400 acres) in the exploitation stage.

The contract device has not been particularly successful in attracting substantial amounts of private capital in the other countries where it has been tried. Although a contract avoids the stigma sometimes attached to the standard oil concession in certain countries, other terms are frequently unacceptable. Most oil companies insist on the right of management and are prepared for up to a 50-50 split of profits in case large production is found.

Exploration and development in Chile have been an exclusive state function since 1928. ENAP has a production of about 5,000 bbl. daily from a group of fields in the Tierra del Fuego, the first of which was discovered in 1945 with the assistance of United States exploration and drilling contractors. A new 20,000-bbl.-daily ENAP refinery was opened near Valparaiso this fall.

Petroleum operations have been a drain on Chile's financial resources. From 1942 to the end of 1953, the government's oil activities had cost about $58,000,000 (at the present exchange rate), including an outlay of $38,000,000 in United States currency. A desire to curtail this expenditure is the main motivation behind the new oil policy.

Guatemala . . . Foreign oil investments were barred from Guatemala during the several years a Communist-dominated government ruled the country. In 1949 the efforts of several companies, including Standard Oil Co. of Ohio, Atlantic Refining Co., and Ohio Oil Co., to negotiate exploration deals collapsed when the country passed a petroleum law ruling out foreign participation.

An oil official, who was recently in Guatemala, said he had no doubt that the present Guatemalan Government, which came to power in last summer's revolution, was "very serious" in its intention to have legislation favorable to private capital. A government commission studying the subject is expected to circulate the draft of a new law for comments in the next month or two.

Some of the constitutional prohibitions against foreign capital already have been relaxed by executive ruling, and the Congress is expected to consider the subject of petroleum legislation when it meets in 2 or 3 months.

Acting at the request of the Guatemalan Government, the Venezuelan Government has dispatched two Hydrocarbons Ministry experts to Guatemala City to assist in the drafting of the new Guatemalan law. The commission at work on the project has been studying oil legislation of other South American countries, but was understood to be unable to employ a foreign expert because of the virtually bankrupt condition of the Guatemalan treasury.

Brazil . . . There is increasing evidence of support for legislation to relax Brazil's stringent Petrobras law passed last year. Attacks on the law have been increasing, and a federal senator, Plinio Pompeu, said he will present a bill to the new Congress to end the Petrobras monopoly.

Earlier this fall, the Federation of Commercial Associations in Brazil recommended in a resolution to the government that the country be opened to foreign oil capital.

The campaign to open up Brazil to private companies is running into stiff opposition. Recent reports from Rio de Janeiro were that Finance Minister Eugenio Gudin may be forced to resign over the Petrobras issue. Hopes that President Cafe would lead the fight on the state-monopoly policy have been disappointing as a result of the president's statement that he would not seek to change the Petrobras setup.

Gen. Juarez Tavora, the president's

chief military adviser and a possible presidential candidate next year, has assured Col. Artur Levi, head of Petrobras, of all possible government support.

Hard economic facts against the background of a changed political setting are causing the reconsideration of oil policy in Brazil.

The country's production of about 2,000 bbl. daily meets only some 2 per cent of a rapidly increasing consumption, and petroleum imports are eating up between 35 and 40 per cent of the country's foreign exchange earnings. The restrictive "state only" oil policy with the Petrobras law was the instrument of the Vargas government which was succeeded by a more liberal regime last summer following Vargas' suicide.

Petrobras is an all-embracing state monopoly in which the public is forced to participate through stiff taxes on vehicles and other transportation. The nationalistic features of the law are so rigid that Brazilians cannot hold any of the minority shares provided for the Brazilian public if they are married to foreigners.

Iran Settlement in Effect

First crude-oil exports made under recent agreement; prices are slightly lower than those of competing oil

THE Iranian oil settlement became a reality last week when oil-company tankers began moving into the country's two oil ports of Abadan and Bandar Mashur.

The agreement which was negotiated during the summer between the Iranian Government and the eight-company international consortium cleared the final legal requirement October 29 with the signing by Shah Mohammed Riza Rahlevi. It was ratified by the Iranian Senate a day earlier by a vote of 41 for, 4 against, and 4 abstaining.

Indicating the desire of the consortium to start operations immediately, an Anglo-Iranian Oil Co., Ltd., tanker, British Advocate, loaded 11,500 tons, or about 75,000 bbl., of fuel oil at Abadan October 30 and sailed the following day for Ceylon.

In London, Anglo-Iranian announced it will change its name to British Petroleum Co., Ltd. The company also revealed plans for a financial reorganization, transferring the equivalent of $225,540,000 from general reserve to capital account and increasing outstanding stock fivefold.

Four other tankers of the consortium companies, including the 15,000-ton Olympic Mariner sailing for Standard Oil Co. (N.J.), were at Bandar Mashur to load crude oil, and a Royal Dutch-Shell tanker, Theliconus, prepared to take on a cargo at Abadan.

It apparently was easy enough to make the initial exports under the recent agreement. Crude oil could be quickly run through field lines to tanker loading points, and products could be drawn from the large quantities left in storage 3 years ago when Anglo-Iranian's staff was expelled. However, resuming full-fledged refinery operations and building up production to the 300,000-bbl. daily minimum guaranteed the first year will call for rehabilitation of some facilities by the consortium.

Prices posted . . . Another development early last week was the posting of Iranian oil prices by several of the eight consortium members. Shell, Esso Export Corp., Standard Oil Co. of California, Socony-Vacuum Oil Co., Inc., and Anglo-Iranian all posted a price of $1.91 for 34°-gravity Iranian crude at Bandar Mashur. This is 2 cents below the price of Arabian crude, adjusted for the gravity difference. The lower price at Bandar Mashur is due to its greater distance up the Persian Gulf.

Shell and Anglo-Iranian announced a price of $1.86 for 34°-gravity Iranian light crude at Abadan. This also is 2 cents lower than the price of Zubair crude at Fao, adjusted for the gravity difference. The same companies posted $1.67 for Iranian heavy crude of 31°-gravity at Abadan, and Esso announced a price of $1.85 for residual fuel oil at Abadan.

Payments announced . . . In London last week, Sir William Fraser, chairman of Anglo-Iranian, confirmed in a letter to stockholders that payments by the consortium to Anglo-Iranian would amount to the equivalent of some $600,000,000.

Of this, £32,400,000 ($90,720,000) will be paid over approximately 12 months in three equal installments, and $510,000,000 will be in the form of the sterling equivalent of a 10-cent a barrel charge on crude oil and products exported by the consortium companies other than Anglo-Iranian.

Besides these sums, Anglo-Iranian will receive the equivalent of $70,000,000 from the government of Iran "in full and final settlement of all claims and counterclaims." This will be paid in 10 equal installments, free of interest, beginning January 1, 1957.

Trade Pact Signed

Argentina to get 2,500 bbl. of crude daily from Bolivia

ARGENTINA eventually will receive 2,500 bbl. daily of Bolivia's expanding, but still small, crude production.

The Bolivian government company, Yacimientos Petroliferos Fiscales Bolvianos, recently completed a trade agreement with Argentina for delivery of the crude.

The crude will be delivered through a 6⅝-in. pipeline from Camiri field to Yacuiba on the Argentina border. The $3,800,000 line was recently contracted by Y.P.F.B. to Williams Brothers Sudamericana, Ltd., which will use 6,500 tons of German pipe for the job.

The pipe which Y.P.F.B. is buying from Stahlunion, Dusseldorf, is costing $176 a metric ton, c.i.f. Buenos Aires, with a 20 per cent payment down, 20 per cent when the pipe is shipped, and 15 per cent every 6 months for 2 years.

According to reports from La Paz, the crude to be sold to Argentina will be priced on the basis of $29 per cubic meter, or approximately $4.61, for Bermejo crude, f.o.b. the Argentine border. When deliveries of the Camiri crude begin, the per barrel value will be about $5.16 because of the higher (27.5°) gravity of the Camiri oil.

Other deals . . . Bolivia's improved supply position also is illustrated in small sales which the state oil company recently made in adjacent areas of Paraguay and Brazil. It recently sold about 3,800 bbl. of motor fuel to Paraguay and hopes for increased sales in this country on a regular basis.

Another oil export agreement was concluded in mid-October with Chile. This calls for the delivery of about 71,500 bbl. of gasoline annually by Bolivia in exchange for 36,000 tons of steel bars and sheets. The agreement was signed by Jose Paz Estenssoro, Y.P.F.B. president, and Guillermo del Pedregal, vice president of the Chilean Development Corp., as the first concrete application of the recent Bolivian-Chilean trade treaty.

Production . . . The discovery of production from a deeper zone in Camiri field has allowed Y.P.F.B. to increase its output to around 4,000 bbl. daily, sufficient for domestic requirements. Production can be stepped up to provide crude for the shipments to Argentina.

Production Falls Again

Free World output of crude oil drops 98,900 bbl. daily for third consecutive decline; most of loss is in U. S.

FURTHER cutbacks in the United States in August caused the third consecutive monthly decline in Free World production of crude oil.

The August average was 12,060,300 bbl. daily, down 98,900 bbl. daily from the previous month. Of this drop, 74,400 bbl. daily occurred in the United States, where output fell to 6,167,400 bbl. daily.

Free World production declined during each of the 3 summer months as result of reductions in the United States. The August Free World average was 274,300 bbl. daily below the May average. In the same 3 months, United States crude production decreased 303,400 bbl. daily.

The same trend of a rising output abroad in the face of declines in the United States shows in figures for the first 8 months of 1954. In this period, total Free World production averaged about 12,181,000 bbl. daily, up 2.9 per cent. In the first 8 months, non-Communist foreign production was up 496,100 bbl. daily, or 9.3 per cent over the same period of 1953.

General trend . . . The production figures point up the fact that consumption of petroleum products abroad is continuing to rise at a relatively greater rate than within the United States. United States crude production also has been adversely affected by the country's great consumption of natural gas, the increasing output of natural gasoline and other light hydrocarbons, and the heavy rate of oil imports.

The drop in non-Communist foreign production which occurred in August as compared to July was 24,500 bbl. daily. Net production for the entire Middle East also was down slightly, mainly as result of lower production in Saudi Arabia.

Production in the Middle East during August averaged 2,747,500 bbl. daily, against 2,758,700 bbl. daily the previous month. For the first 8 months of the year, output of the oil countries of the Middle East average 2,676,000 bbl. daily, an increase of 265,000 bbl. daily, or 11 per cent over the same period of 1953.

Of the individual countries in the Middle East, Kuwait rose to a near record in August, averaging 1,100,300 bbl. daily. This was less than 1,000 bbl. daily below the all-time record for the shaikhdom last March. It also marked the third time that production of any of the Middle East countries has topped a million barrels daily.

Saudi Arabia drops . . . In contrast to the increase in Kuwait, Saudi Arabian production was down 32,400 bbl. daily. The August average of 919,100 bbl. daily was nearly 108,000 bbl. daily below the record of 1,026,800 bbl. daily set last May.

Production from Zubair in southern Iraq rose to a new record of 104,500 bbl. daily in August. Most of the country's remaining output comes from Kirkuk field which in August yielded 497,200 bbl. daily. Production in the Neutral Zone continues to be estimated in the absence of official information. Industry reports indicated an output of about 18,000 bbl. daily in August.

For the first 8 months of the year, Saudi Arabia holds the lead as the top producing country of the Middle East, with an average for the period of 957,900 bbl. daily. Kuwait's 8-month average was 922,100 bbl. daily, and Iraq, 617,000 bbl. daily.

France climbing . . . French production continues to show sharp gains as a result of the Esso Standard development at Parentis. Of the August output of about 11,500 bbl. daily, around

TREND OVER THE LAST YEAR
(Thousands of barrels daily)

1953—	Western Hemisphere less U. S.	Middle East	Total non-Communist foreign
September	2,485.7	2,416.4	5,345.3
October	2,519.5	2,528.1	5,511.5
November	2,651.9	2,341.7	5,461.6
December	2,711.9	2,540.2	5,714.1
1954—			
January	2,682.8	2,491.2	5,636.4
February	2,703.7	2,550.6	5,695.3
March	2,642.9	2,767.6	5,872.7
April	2,565.1	2,642.0	5,653.1
May	2,639.3	2,766.0	5,863.8
June	2,648.5	2,685.0	2,805.5
July	2,685.2	2,758.7	5,917.4
August	2,664.5	2,747.5	5,892.9

CRUDE-OIL PRODUCTION
(Daily average in thousands of barrels)

Country—	Aug. 1954	July 1954	Aug. 1953
W. Hemisphere:			
Argentina	77.0	76.9	76.1
Bolivia	4.5	4.5	1.6
Brazil	2.1	2.1	2.8
Canada	290.0	296.2	267.5
Chile	4.5	4.5	3.1
Colombia	102.6	107.4	103.8
Cuba	0.1	0.1	0.1
Ecuador	8.6	8.5	8.0
Mexico	238.0	230.0	200.6
Peru	47.5	46.2	44.9
Trinidad	65.4	64.5	60.6
Venezuela	1,824.2	1,844.3	1,682.1
Total	2,664.5	2,685.2	2,451.2
W. Europe & Africa:			
Algeria	1.4	1.3	1.7
France	11.5	9.1	7.2
Fr. Morocco	2.5	2.4	2.0
W. Germany	53.0	52.3	44.3
Italy	1.4	1.4	1.8
Netherlands	18.5	18.5	16.0
Egypt	37.1	38.0	45.5
United Kingdom	1.2	1.2	1.1
Total	126.6	124.2	119.6
Middle East:			
Bahrain	30.3	30.2	30.1
Iran	30.6	36.5	35.2
Iraq	639.9	641.8	595.6
Kuwait	1,011.3	976.2	875.6
Neutral Zone	18.0	20.0	
Qatar	97.1	101.5	95.3
Saudi Arabia	919.1	951.5	856.6
Turkey	1.2	1.0	0.6
Total	2,747.5	2,758.7	2,489.0
Other Asia:			
British Borneo	100.0	99.5	103.2
Burma	3.5	3.5	3.4
India	7.0	7.0	6.3
Indonesia	220.0	215.0	209.7
Japan	5.7	6.0	6.0
New Guinea	12.9	13.1	4.8
Pakistan	5.2	5.2	3.2
Total	354.3	349.3	336.6
Total non-Communist foreign	5,892.9	5,917.4	5,396.4
United States	6,167.4	6,241.8	6,582.5
Total Free World	12,060.3	12,159.2	11,978.9
Russia & Eastern Europe:			
Russian Zone of Austria	62.0	62.0	65.0
Romania	110.0	110.0	95.0
Russia	1,160.0	1,160.0	1,060.0
Other Communist	36.8	36.8	34.6
Total	1,368.8	1,368.8	1,254.6
World total	13,429.1	13,528.0	13,233.5

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for certain other countries, particularly in Southeast Asia, for which completely current reports are lacking. Iranian production shown is net output, or the gross less recycled material. Other Communist includes China and Yugoslavia as well as the Soviet satellite countries in Europe.

4,000 bbl. daily came from the new Jersey Standard field.

A decline in Asl field in the Sinai further depressed Egypt's production in August. The drop in Asl to about 5,800 bbl. daily was partially offset by an increase in Saudr field production.

In the Western Hemisphere, Venezuelan production was down 20,100 bbl. daily. The country's average for the first 8 months was 1,859,600 bbl. daily, as compared to 1,734,400 bbl. daily in the corresponding 1953 period. Production in Trinidad in August showed another small increase to reach a new high of 65,400 bbl. daily.

Lake Line Planned

Shell asks bids on 45-mile outlet for Maracaibo crude

COMPANIA SHELL DE VENEZUELA has issued invitations to contractors for bidding on the construction of a 45-mile crude pipeline from its Block I field off the western shore of Lake Maracaibo to its terminal at Palmarejo about 12 miles north of the city of Maracaibo.

The line, to be known as "Lapline," will run 18 miles in the lake and 27 miles on land. The underwater section will be 16 in. in diameter and the remainder 24 in.

The line will start at a platform located in the northern part of the company's concessions in the lake. The water is 65 ft. deep at the platform, deepest spot along the route. From the platform, the line will run to near the village of La Ensendada. Scraper-trap facilities will be installed near La Ensendada.

The northern terminus of the line is the Palmarejo tank farm. Two 80,000-bbl. tanks are being added to the existing 1,200,000-bbl. storage at Palmarejo to accommodate the additional grade of crude in the farm.

Main submarine collecting lines now under construction from the field gathering stations will be extended to the lake platform and connected to the new main pipeline. Gathering stations will pump directly to Palmarejo with no further boosting. Nominal capacity under pumping conditions is estimated at 100,000-bbl. daily delivery to the tanks in Palmarejo.

The crude is partly destined as intake to the Cardon refinery. The remainder will be exported.

What is planned . . . The 18-mile submarine section will use 16-in. O.D., 0.375-in. wall, 62.58-lb. per foot Grade B pipe. All joints will be welded, and the whole section will receive a double coating of coal-tar enamel with glass-floss reinforcing, one wrap of coal tar impregnated asbestos felt and a sheath of gunite about 1½-in. thick weighing approximately 81.3 lb. per lineal foot when using 140 lb./cu. ft. concrete. No weights will be used since the empty pipe, after gunite application, will have a negative buoyancy of 21.9 lb. per lineal foot.

The 27 miles of overland section will use 24-in. O.D., 0.312-in. wall, grade X-42 electric weld pipe, all joints being welded. Most of the pipe will be laid uncoated on top of the ground.

The field, one of three lake concessions held by Shell, was discovered in 1947 and currently produces 11,000 bbl. per day of 27.4° gravity crude. Development is being carried out from three drilling barges.

Hudson Gets Sui Contract

Hudson Engineering Corp., Houston, has been awarded contract by Pakistan Petroleum, Ltd. for design and installation of a gas-gathering system and gas-processing plant in the Sui gas field of West Pakistan.

After treatment, gas will be transported through a 350-mile pipeline extending to Karachi *(The Oil and Gas Journal, February 22, page 127)*. Greater utilization of the vast Sui gas reserves will sharply reduce the country's requirements of imported coal and make possible a nitrogenous fertilizer plant proposed by the government.

Concession In Egypt Granted

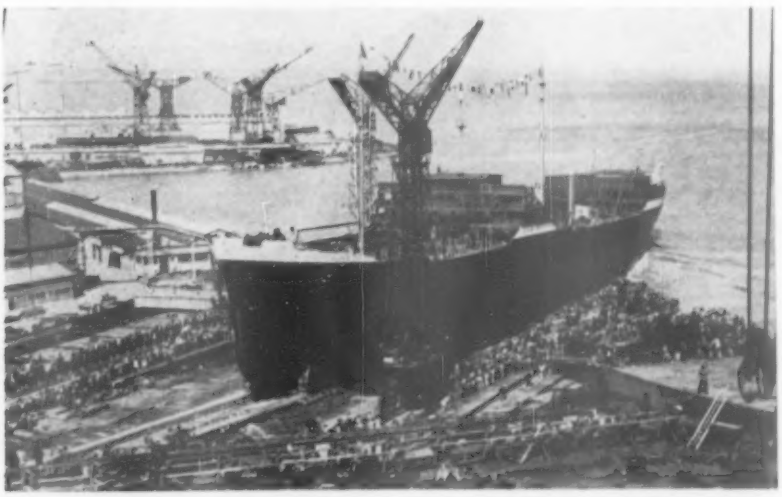
German interests have obtained a 30-year oil exploration and production concession in the Sinai Peninsula of Egypt.

The company is Gewerkschaft Vereignigte Borgholghausen, Hanover. The concession agreement was signed in Cairo by its director, Dr. Erik Stolberg, and Dr. Hassan Marei, the Egyptian minister of commerce and industry.

The German firm was granted rights in 29 areas covering 2,900 sq. km. (1,120 sq. miles). The Egyptian Government was given a royalty of 15 per cent under the agreement.

Sweden Opens Lube Plant

A new blending and packing plant for lubricating oils has been opened by Svenska Shell at Rasta, near Stockholm, Sweden. The plant will handle more than 20,000 tons a year, producing a full line of major lubricants. The facilities cost the equivalent of more than $1,120,000.



Another Big Tanker Goes to Sea

One of the largest tankers ever built in France, the 31,000-ton Isanda, is shown here at launching. It is the first of four vessels of this size ordered by Soc. Maritime Shell from the Penhoet yard of Chantier & Ateliers, St. Nazaire.

What's the score on

ELECTRONIC PROCESS CONTROL?

Editor's Note: The first refinery unit in the United States to be completely instrumented and controlled by electronic means has recently gone on stream in Indianapolis. Operating results thus far seem to indicate that for some installations electronic instrumentation will give superior control results.

While this is not the first such installation (there are electronically instrumented units at refineries in the United Kingdom and the Middle East), it nonetheless has aroused an interest previously lacking on the part of instrumentation people in this country.

Interviews with leading instrument manufacturers and a number of instrument users at the recent International Instrument Congress in Philadelphia, and at process plants and instrument factories throughout the country, indicate an accelerated pace in utilization of all-electronic control systems. The manufacturers have been conducting research along these lines for several years, and are prepared, they say, to meet needs of processors as they are made known.

An executive of one large instrument company summed up the feelings of most of the people interviewed when he said, "We expect an accelerated demand for all-electronic control systems, and we have been working on such systems for several years. At the same time, we feel that there are and always will be a number of applications where pneumatic controllers will do a better job. We are also making a number of improvements in our pneumatic instruments."

To focus attention on this development, the Journal presents here a three-part discussion of all-electronic process instrumentation. The first article describes the new United States installation. The second article poses the question, "Why electronic process control?" The third article describes a typical electronic process control system.—*G. L. Farrar*

1. Rock Island's Use On New Platformer

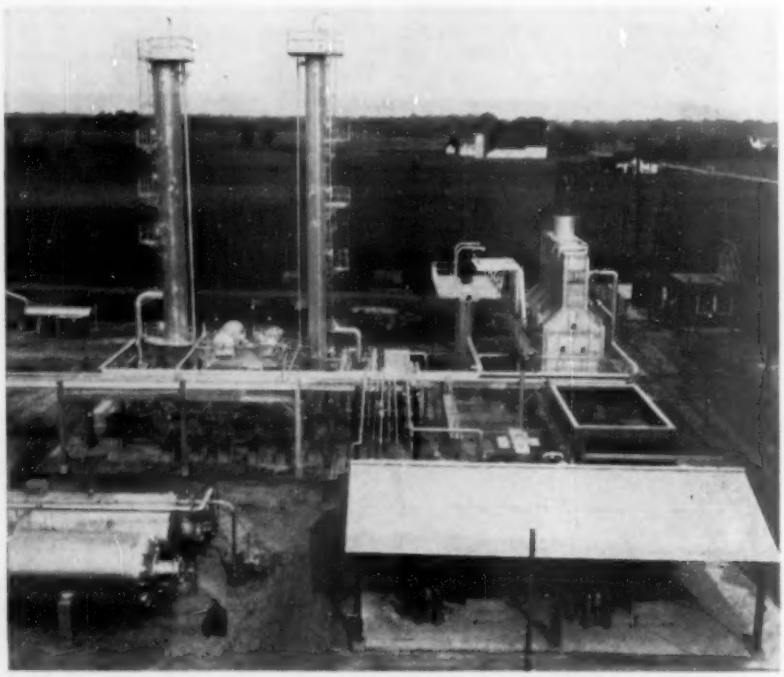
by D. M. Boyd

IN starting up a new 2,400-bbl. per stream day U.O.P. Platforming unit recently, Rock Island Refining Corp., at Indianapolis, pioneered a new step in the field of process control.

The new Platformer is the first complete refinery unit in the United States to be controlled by electronic instruments. In adopting this system, Rock Island has followed the trend of present-day process control—a field which has been noted for its rapid change and improvement in a relatively short time.

Based on instruments costs for the Rock Island unit, it is estimated that electronic instrumentation of a unit costs somewhat less than a pneumatic outlay. The electronic instruments cost about 6 per cent more than do the pneumatic. Control board costs are approximately the same. There is enough saving on tubing and tubing racks to more than make up for the higher instrument first cost.

Author is head of the instrument department, Universal Oil Products Co., Des Plaines, Ill.

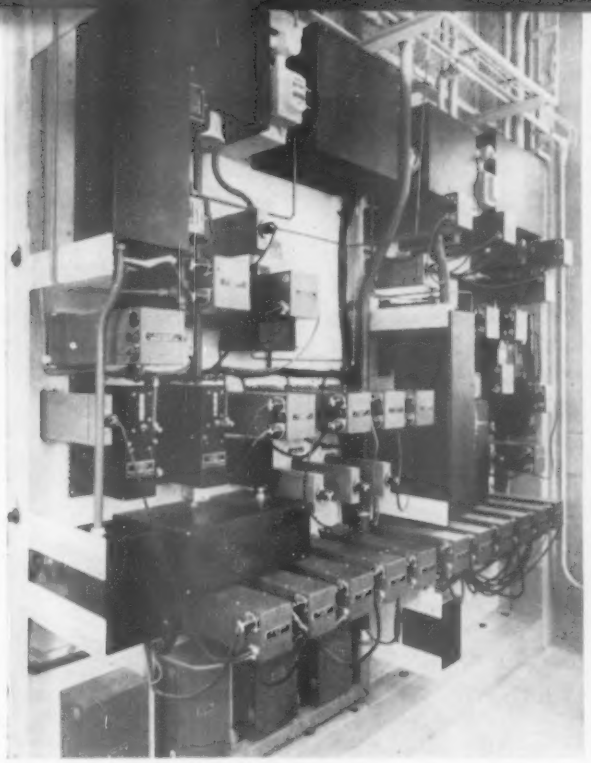


Over-all view of the U.O.P. Platforming unit at Rock Island Refining Corp., at Indianapolis. This is the first refinery unit in the United States to be completely controlled with electronic instruments.

Electric transmission . . . In the electronic type of control system, all of the transmission of measurement and control functions to and from the control room is electrical, making it no longer necessary to run air lines from the process unit to the control room and back again. These are replaced by conduit laid in an existing pipe rack which supports the process piping or may use the same conduit required for the light and thermocouple lead lines already installed in the plant.

The electronic control system such as is now in operation at Rock Island requires air to move the valve. The electropneumatic converters used for the ultimate movement of the valve can be fitted with a small electric heater which will keep the only air pilot used in the control system warm and prevent its freezing up in cold weather.

Operating experience gained so far



Back of the graphic control panel for the U.O.P. Platforming unit at Rock Island Refining Corp., Indianapolis, showing electronic instruments.

Note virtual absence of tubing at corner of Platforming unit control house. Electrical connections to and from control panel are carried in conduits.

at Rock Island has proved that electronic control instruments have an even smaller dead band, or lack of sensitivity, than was formerly noted in pneumatic instruments.

Temperature Control

The normal design of a temperature controller of the thermocouple type has not permitted optimum use of the derivative function because there usually is a mechanical means of balancing the potentiometer circuit, in order to convert the electrical impulse to a pneumatic control impulse and to provide a record. It is possible that the process temperature may change slowly and will not be detected by the mechanical balancing mechanism until it is fairly large. Then it will suddenly "catch up," causing the derivative unit to sense a sudden change and make a large correction to the valve, which could upset the plant.

With the electronic control system, it is not necessary to interpose the mechanical balancing step to convert the electrical thermocouple signal to a control function.

The installation at Rock Island has shown the value of this feature. The derivative settings have been adjusted to rates that were never thought practical before on similar applications because of the distorted picture that was obtained of the rate of change in the process. By being able to use greater derivative action and by having greater sensitivity in the controller, it has been possible to correct even very small temperature changes before they became noticeable on the recorder.

The equipment in use at Rock Island has proved superior to the pneumatic control system. For example, in normal pneumatic control, a transmitter is located in the plant area to convert the measured process variables to 3 to 15 psi. of air pressure.

A pneumatic control system compares the transmitted air pressure with an air pressure that has been set by the operator to correspond to his desired process variable. The controller then sends a given air pressure to the control valve, which holds the valve in position to keep the measured process variable at the desired value. The electronic controllers used at Rock Island take the transmitted electrical signal and compare it with an electrical signal that has been set by the operator to correspond to his desired process variable.

The controller then sends an electrical current to the control valve, which, through an electropneumatic converter and a diaphragm head, holds the valve in a position that will keep the measured process variable at the desired value.

Control-board equipment at Rock Island was designed to simplify servicing. Each of the units was designed to plug into its own housing. If one of the units needs servicing, the service man has only to unplug the unit and plug in a spare unit. All of the recorders and controllers are interchangeable.

The circuits are so arranged that the recorder is completely independent of the controller and vice versa. A breakdown in the recorder will not affect the control of the plant, nor will a breakdown in the controller affect the record of the process variable. The circuits are so arranged that a power failure will cause the valve to assume the same position that it does on air failure.

2. WHY Electronic Process Control?

by D. M. Boyd

ELECTRONIC controllers have several big advantages over present pneumatic controllers as follows:

- They are more reliable in cold climate.
- They eliminate the need for tubing racks.
- They can give better control, due to their greater sensitivity or lack of dead band.
- They will give increased flexibility in some of the more complicated control problems.
- Electronic controls should have less noise.

These advantages were discovered in a series of evaluation tests made by

Adapted from paper presented at I.S.A. meeting, Philadelphia, September 15, 1954.

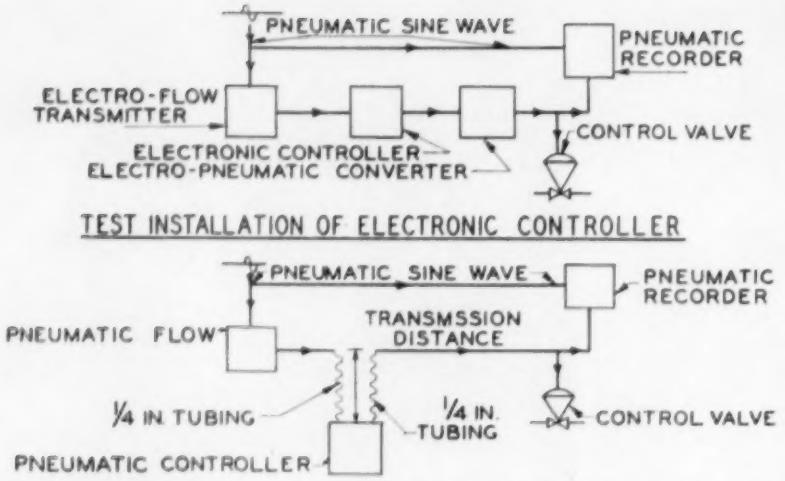


Fig. 1—Schematic diagram of test installation for electronic (upper half) and pneumatic (lower half) controllers.

the instrument department of Universal Oil Products.

Frequency response tests . . . In order to evaluate the performance of electronic controllers in comparison to the pneumatic controllers in use today, frequency response runs were made on two of each which were available on the present market.

The tests were run by loading a pneumatic sine wave into the flow transmitter and recording the output pressure of the controller at a 10-in. diaphragm topworks, as shown in Fig. 1. In this manner a performance picture was obtained of the whole control system from the measurement by the transmitter to the actual pressure change in the diaphragm motor topworks.

Fig. 2 shows the comparison of the frequency response of the two electronic controllers and the two pneumatic controllers. The pneumatic controllers were each checked with and without the effect of 100 ft. of ¼-in. transmission line to and from the field.

It can be seen from the phase shifts and magnitude ratios, that while the performance of the electronic controllers is not as good as that of the valve-mounted pneumatic controllers, it is better than the performance of the pneumatic controllers mounted on a control board 100 ft. away.

This proves to be a rude awakening from our visions of high-speed performance from an electronic controller. The fact is that although the transmission and control are almost instantaneous there still remains the valve to be moved pneumatically and the air pilots supplied with the electronic controllers did not quite have the air-handling capacity of some of the pneumatic controllers.

This shows up when the controllers are mounted directly on the diaphragm top. The introduction of only 6 ft. of ¼-in. copper tubing will bring the performance of the pneumatic controller down to that of the electronic controllers. If one element in the control system is slow, it slows the whole system.

It is interesting to note that, while the addition of an amplifying relay or valve positioner to a control system with the controller 100 ft. from the valve will help the magnitude ratio, it presents some rather serious difficulties as far as phase shift is concerned. Thus, while a pneumatic controller mounted on a board 100 ft. away from the valve could be made to move the valve with as great a magnitude ratio as an electronic controller, or a valve-mounted pneumatic controller, it would have a serious phase shift or stability problem.

Therefore, we are presented with the performance picture of the new electronic controllers. The controllers are not quite as fast as properly installed pneumatic controllers, but are faster than the usual installation of pneumatic controllers. The question is whether industry is ready to change to electronics. If speed were the only consideration the answer would probably be no.

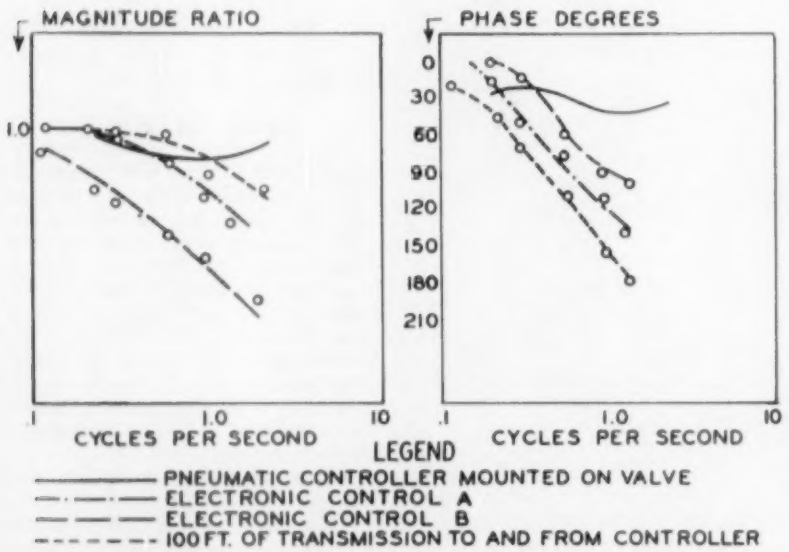


Fig. 2—Relative frequency response curves—electronic controllers versus valve-mounted pneumatic controllers with 100 ft. of tubing between controller and valve.

Problems Presented by Use of Air

Automatic control in the northern climates, however, has always been under a serious handicap due to the problem of handling instrument air at low temperatures. At the present time, there is quite a growth in the northern process industries and this should warrant serious consideration of an electronic system of measurement and control, if for no other reason than increased dependability under severe conditions of cold.

Considerable trouble was experienced in the early operation of a unit in a refinery in Canada, due to troubles with the instrument air. Inasmuch as the measurement of all of the process variables except temperature, required air, even a small amount of wet instrument air would leave the operators blind as far as knowing what the conditions were in the unit.

The present electronic instruments promise an improvement in that they would at least continue to give a measurement under these conditions. It is,

however, unfortunate that they still require air to move a control valve.

Actually, air is a very poor medium for operating a valve. It is very expensive. An instrument air system for a plant with 80 controllers could easily cost $15,000. Air, of course, is compressible and this presents serious problems sometimes when there is a dynamic unbalance existing across the control valve, as many engineers can testify.

Air-diaphragm motors have always presented a problem to designers of diaphragm control valves due to their short stroke and instability under severe valve unbalance. The main reason that air is so popular is the ease with which the control functions can be obtained. However, with an electronic controller this is no longer a factor.

Another problem that is inherent with an air system is the positioning of the valve with air failure. Most of the time it would be best for the valve to remain in one spot upon air failure. This is very difficult to do with a diaphragm motor valve.

Alternate Means for Valve Actuation

An electric motor geared to the valve shaft would not be a practical solution to the problem. A motor and gears with enough power and speed that would compare with present pneumatic valves would be too costly an installation to consider. Besides the question of cost is the fact that the normal process control valve spends 90 per cent of its life in one position moving only very slightly either way from this point. This means that there would be a terrific concentration of wear at one point on the gear train.

A more practical solution appears to be an electrohydraulic approach. A relatively small motor and pump equipped with an accumulator can deliver a large amount of power for a short time, probably enough to handle most normal transients.

The output of the controller would be used to operate the pilot valve in the hydraulic line. While such a system is capable of extremely high-speed performance, it is doubtful if it would be necessary to consider any responses faster than 1 cycle per second for a majority of process uses. For this reason a much simpler and consequently less expensive system could be used.

In the event that an instrument air system could be eliminated from a plant, it would be possible to spend approximately $175 extra per control valve over the present cost of a pneumatic valve.

No tubing racks . . . Other advantages also accrue when using electronic controllers. Electrical leads, used for measurement transmission in electronic controllers, can be pulled through conduit supported in a regular pipe rack. This eliminates the need for a tubing rack, which is both costly and difficult to maintain.

Increased flexibility results when using electronic controllers, since interrelation of the actions of several controllers is easily accomplished. This makes possible the cascading, limiting, and overriding of controllers which more complicated processes require. It also makes possible the addition of multiplying, integrating, and differentiating functions to controllers. This is a necessary step if process plants are to be operated by computers, a possibility that is being given much thought.

Better control . . . Most of the critical control points on a processing unit have long time constants, due to process lag, and a fast action by the controller will not help over-all control materially. Under these conditions, however, the dead band in the controller does become important. The greater the dead band the longer will be the time required for the controller to detect the initial error between the measured variable and the desired value.

It is often found that full use can not be made of the derivative function in a controller because of the noise present in the system, either in the process or the controller. With the electronic controller, it should be easier to make use of some of the servomechanism techniques of filtering out undesirable noise, thus obtaining more effective use of the derivative function.

3. How an Electronic Process Control System WORKS

by Roger Gilliland

ELECTRICAL operation of control systems has long been recognized as an ideal solution to the problem of control in large-scale operations. Its infinite speed and sensitivity are now finding applications where pneumatic-type devices could never produce the desired results. Dependability of components has been proved in the vast communication and military fields.

Present-day costs are comparable to pneumatic systems and ultimately will be much lower as can be seen from the histories of the television and radio markets. This means more instrumentation for the same first cost.

The electronic systems available are similar in appearance to the pneumatic type. Fig. 3 shows that a complete system has a transmitter located at the point of measurement, a recorder, controller, and manual panel in the control room which is probably at a remote location, and an electropneumatic transducer at the final control element.

All transmission is accomplished instantaneously in the form of electrical quantities just as though each independent recording-controlling system were field mounted. Corrective valve action occurs at the same instant that the slightest process deviation occurs. Sensitivities of an entire control loop have been checked to be in the neighborhood of 1 part in 28,000 in evaluation tests.

Author is with Swartwout Co., Alhambra, Calif. Adapted from paper presented at annual meeting, Petroleum Division, A.S.M.E., September 28, 1954.

Electronic System Components

The development of the electrical signal, comparison to the desired value, and modulation of the final control element can be accomplished in a variety of ways. Fig. 4 shows a schematic drawing of the conversion portion of one electrical transmitter.

The variable to be measured is converted to a force by means of a diaphragm, bellows, bourdon tube, or similar device applied to lever AA at its left hand end. This force causes a movement of lever AA about the fulcrum BB and this movement is transmitted and amplified through a series of spring pivots until at lever HH a much larger movement has resulted. The core of the differential transformer is attached to lever HH at LL and will move up and down within the coil of the transformer as the variable changes.

A differential transformer is a device which produces an extremely linear and accurate electrical signal with respect to the travel of its core. Thus, an electrical signal which is directly proportional to the force or movement generated by the variable is produced. The motion of lever HH is resisted by a spring, so that adjustment of its compression will set the zero of the transmitter. Point GG is an adjustable

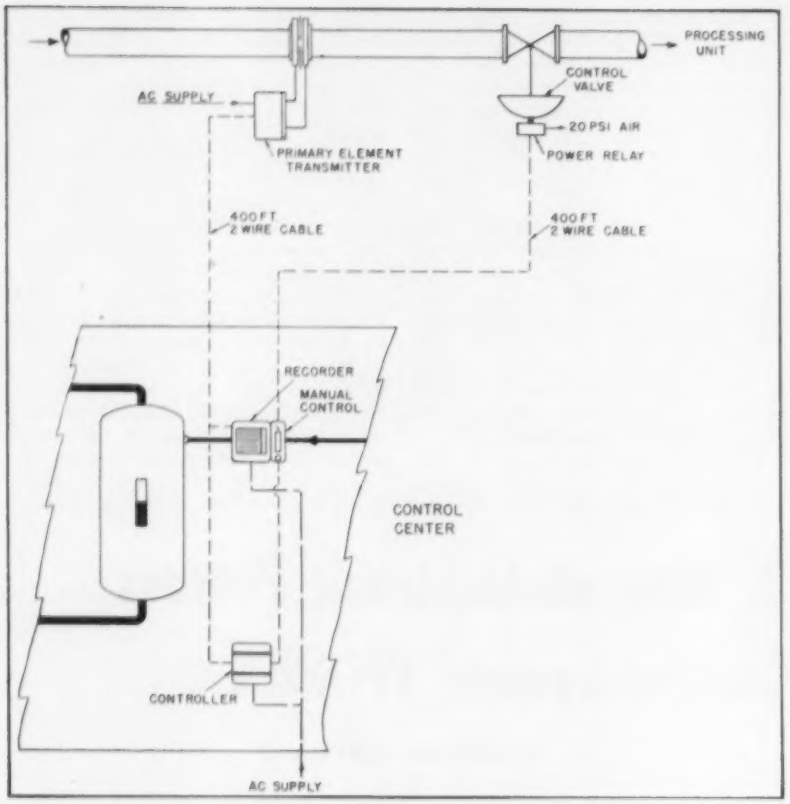


Fig. 3—Typical flow-control diagram.

spring pivot point in the amplifying linkage and movement of its relative position will either increase or decrease the amplification. Therefore, a given movement of lever AA can be made to result in a variety of movements of the core of the differential transformer at position LL on level HH.

This adjustable fulcrum permits span adjustment of the transmitter for the desired full range of the variable being measured. This gives a means of producing an accurate electrical signal directly proportional to the variable. We have also incorporated means for selecting the value of the variable at which the transmitter will start to produce this signal and a means of varying the amount of the change we will obtain for a given change in the process being measured.

Accurate electrical information so obtained can be transmitted instantaneously to a remote location and converted back to a movement which will indicate the condition at the process.

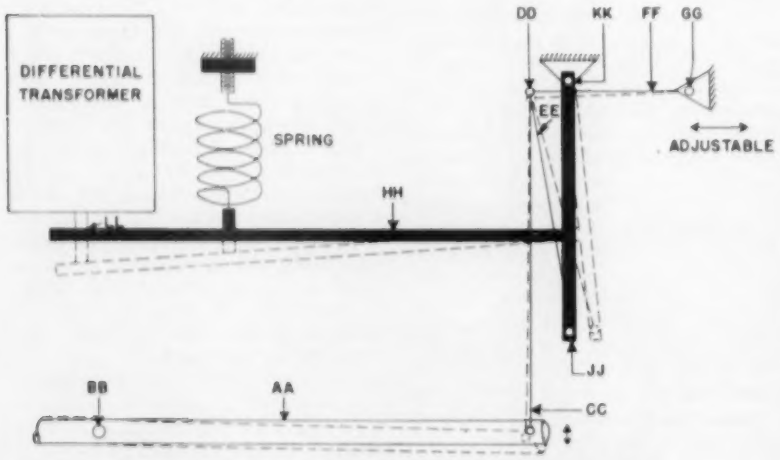


Fig. 4—Schematic diagram of typical electronic conversion unit.

Refining Technology

Impulse conversion . . . Fig. 5 shows one method of accomplishing this conversion. An indication or record of the variable will require motion of a pen on a chart or a needle on a scale but motion is subject to friction and, hence, inaccuracy. A servo-type device will give the best accuracy and the highest speed of response without instability. An amplifier compares the transmitter signal to another signal generated by the pen or needle position. This amplifier produces an output which is directly proportional to the difference between the indication we are reading and the signal being received.

This differential amplifier output is fed to a phase-sensitive rectifier which measures the magnitude of the difference while also indicating the higher of the two variables. This rectifier controls the power output of a power amplifier which, in turn, drives the pen or needle through a rotary-type solenoid. Due to the high amplification of the electronic system there is considerable force available to drive the visible indication to its correct value.

The adjustable response network is a feed back which reduces the amplification of the power amplifier at higher frequencies so that pen or needle fluctuations can be eliminated when pulsations are present in the process. This adjustment does not affect the accuracy of our information nor the speed of response of our control system since it only damps high speed pen or needle movement.

Controller . . . In the controller the accurate signal received from the transmitter is compared to an accurate value desired as received from a manually adjusted set-point unit. The difference between these signals is amplified by an adjustable amount as determined by the setting of a degenerative feed-back network around the amplifier.

This adjustment is comparable to proportional band used in pneumatic instrumentation. The phase of the amplified output signal is determined by the largest of the amplifier inputs and its magnitude is a measure of the difference. A phase-sensitive rectifier receives the amplifier signal and converts it to d.c. of a magnitude proportional to the value of the input and positive or negative with respect to ground corresponding to the polarity of the input. This output is fed into a rate amplifier (when rate action is desired) which is a 1:1 ratio unit when the input is constant.

An adjustable feed-back network delays feed back during periods of changing input signals causing a high amplification for an adjustable period of time,

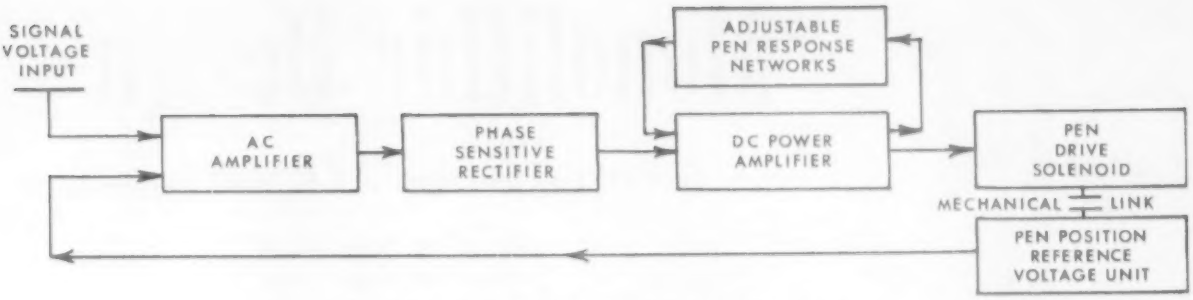


Fig. 5—Schematic electronic recorder or indicator diagram.

thereby providing a rate-action control function. This resistor-capacitor feed-back network delay will gradually disappear and the amplifier will return to its 1:1 ratio. The rate-action amplifier output is the input to a voltage and a power amplifier with an adjustable feed-back network around the combination.

This network provides high amplification with a steady state or slowly changing input and lower amplification on rapidly changing signals. It provides the controller with an initially wide proportional band for fast changes which will slowly reduce itself to a narrow proportional band as the process upset subsides. The time in which this occurs is adjustable by means of the reset calibration readily available from the front of the controller. The final controller output has been developed completely electronically without the use of a moving part.

Fig. 6 shows one type of electronic controller.

Valve operation . . . The diaphragm valve like the pneumatic controller has advanced with the need for better regulation. Today's electronic systems recognize the present proven acceptability of this final control element in the petroleum and chemical fields by utilizing electropneumatic transducers on the controller output to convert to the air pressure necessary to modulate such valve. Fig. 7 shows one of the designs of such a transducer. The controller output is wired to a moving coil in a permanent magnet field.

This coil is connected to a lever which transmits a force proportional to the controller output to an air portion of the unit. A diaphragm of a given area will produce an equal force by changing the air pressure in the pilot section. This variable air pressure is imposed upon a diaphragm in the booster section to produce a similar or higher air pressure in the large volumes necessary to move diaphragm motor valves rapidly.

The self-powered modulating valve operator in the form of an electric motor or electrohydraulic pump drive has not had the intensive demand for refinement as has the diaphragm unit and it has lagged behind the needs of the industry. Now that control systems are available to utilize operators of this type, some new developments are being released and greater strides forward can be expected in the future. Self-contained operators would eliminate the need for a centralized supply of motive power and the complicated distribution systems now required in large scale installations.

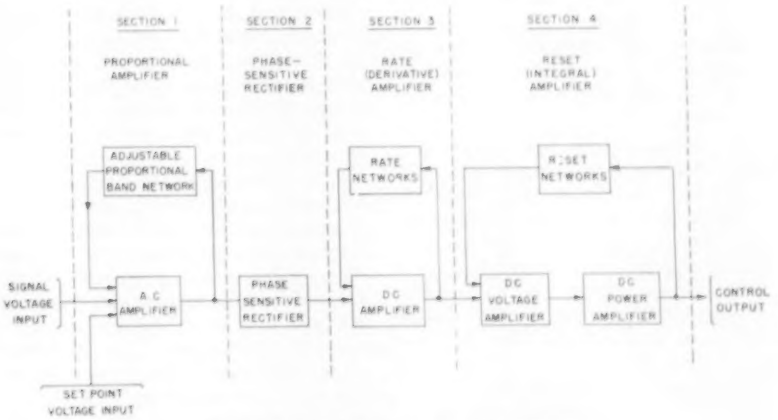


Fig. 6—Schematic electronic controller diagram.

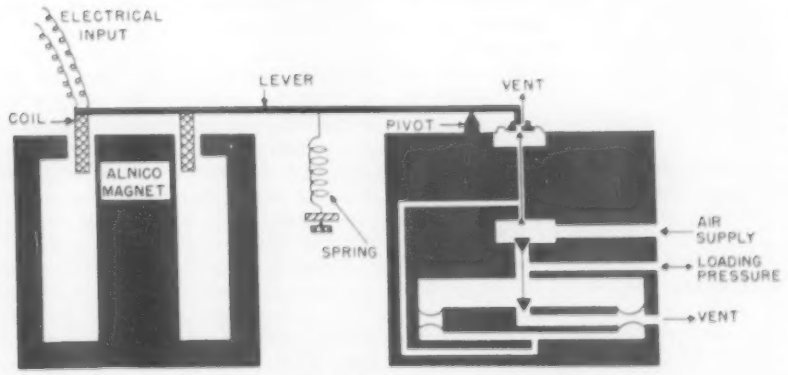


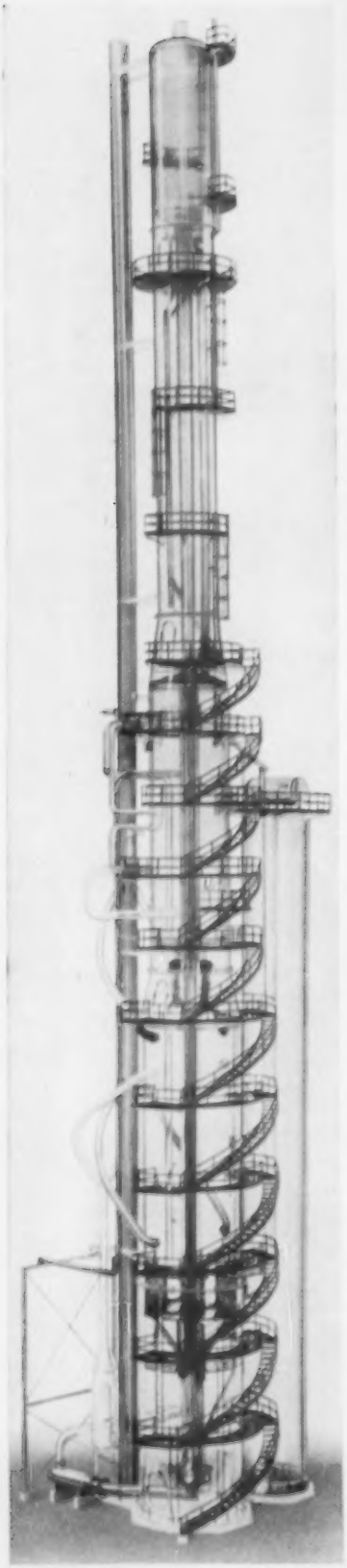
Fig. 7—Schematic electropneumatic transducer diagram.

Refining Technology

BOOK

GUIDEBOOK, PRYOR MOUNTAINS-NORTHERN BIGHORN BASIN, MONTANA. Fifth annual field conference, Billings Geological Society, September 9-11, 1954. Printed on glossy paper and bound in hard cover. $7.50. ($5 to libraries.) Obtained from Billings Geological Service, 807 Grand Avenue, Billings, Mont. Copies of Oil and Gas Penetration Chart of Montana that appear in the guidebook obtainable from same address for 50 cents each, folded, and 60 cents each, rolled.

Guidebook in 165 pages exclusive of advertising contains 7 stratigraphic papers, report and map covering the tectonics of the Bighorn-Beartooth Mountains region, reports and maps of 16 oil and gas fields and 2 coal fields in field conference and adjacent areas of Montana and Wyoming, stratigraphic cross-sections, road logs, a catalog of formation names, and numerous reference maps and illustrations.



SCALE MODEL of new packaged T.C.C. plant.

Monolithic Design

. . . Cuts cost of packaged T.C.C. plant construction

by D. H. Stormont
West Coast District Editor

IN place of erecting a structural-steel tower to support the several process vessels required in Thermofor catalytic cracking units, why not eliminate the costly structure and stack the vessels one on top of another so that they become self-supporting?

As there apparently is no reason why this cannot be done, the industry in the near future will see such a monolithic-type packaged unit. The streamlined structure is expected to offer economies in engineering, material, fabrication, and erection, without changing or interfering with the process' established design or requirements.

Supported by cylindrical steel skirts, the reactor will be mounted above the kiln, and then above the reactor at the proper elevation will be the separator surge. The catalyst lift line, around which conventional T.C.C. plants are designed, will tunnel through the reactor and kiln instead of being placed off center.

By means of this provision, which eliminates the approximately 10-ft. offset usually required, over-all height of a 10,000-bbl. packaged unit will be reduced from 272 to 252 ft. Through eliminating the structural tower, steel requirements will be cut by approximately 250 tons; erection time will be cut more than 50 per cent, or from about 3 months to a few weeks. Most important, it is expected that over-all costs of a unit of this size will be cut by as much as $500,000.

Still other advantages pointed out by the designers, Succop Refinery Engineering Co., Los Angeles, are that the structure is better suited to withstand fires, and that its design provides increased accessibility to all areas.

Design of structure . . . As shown in the diagrams and photograph of the plastic scale model, the main structure consists of the three A.P.I.-A.S.T.M. code vessels supported by cylindrical steel skirts. Height of the surge unit is set by the flow of the catalyst from that vessel to the reactor. Clearance between the reactor and kiln is for valve operation and ease of inspection. Height of the kiln is based on the flow of the catalyst from the kiln through the coolers to the lift pot. In the diagram, grade elevation is taken as 100 ft.

With these elevations established, steel skirts of proper height were designed to place the three vessels at those levels. Aside from a slight increase in the diameter of the kiln and reactor to offset space required by the tunnel, design and shape of the vessels are the same as those in conventional units.

Because of fireproofing requirements, portion of the steel structure below the kiln must be coated with approximately 2 in. of concrete. Accordingly, in some cases the structure up to the 40-ft. level will consist of steel-reinforced concrete.

Design of the unit lends itself equally well to either the steel skirt at grade, for a complete package job, or to the reinforced-concrete style. Among other things, choice will be governed by the job site and the construction time schedule.

In a conventional packaged 10,000-bbl. unit, approximately 300 tons of structural steel are used to support these three vessels, including that for the stairs, ladders, and platforms. In the Succop type packaged unit, most of this steel and its fabrication and erection will be eliminated. The platforms, stairs, and ladders are located on the east half of the structure, with the pipe and their supports on the west half. The lift pipe and flue-gas stack are guided by the main structure as shown in the diagram.

Lift-pipe tunnel . . . In order that the catalyst lift pipe can be constructed concentric with the separator surge and the primary axis of the structure, tunnels were designed to run through the kiln and reactor as shown. Diameter of the tunnel was held as small as possible; in this case, 3½ ft.

Using this small tunnel it was not necessary to insulate the lift pipe. Therefore packed slip joints were used at the top and bottom of the reactor and kiln. This will effectively heat-seal the lift pipe within the tunnel, eliminating

the need for insulation. As this type slip joint is commonly used on the separator surge vessels in conventional units, its adoption to the tunnel will pose no new problem, its designer declares.

In applying the slip joint to the kiln, a problem arose because of the kiln being insulated on the inside and the tunnel being insulated on the outside. This caused expansion of the tunnel due to heat of the lift pipe. Addition of a second slip joint between the tunnel and the kiln overcomes this problem. In other words, the lift pipe will be free to slip in the tunnel and the tunnel to slip in the kiln.

Because the entire tower will expand in unison, stress studies indicate piping expansion conditions will be about 50 per cent less than those encountered in conventional T.C.C. towers.

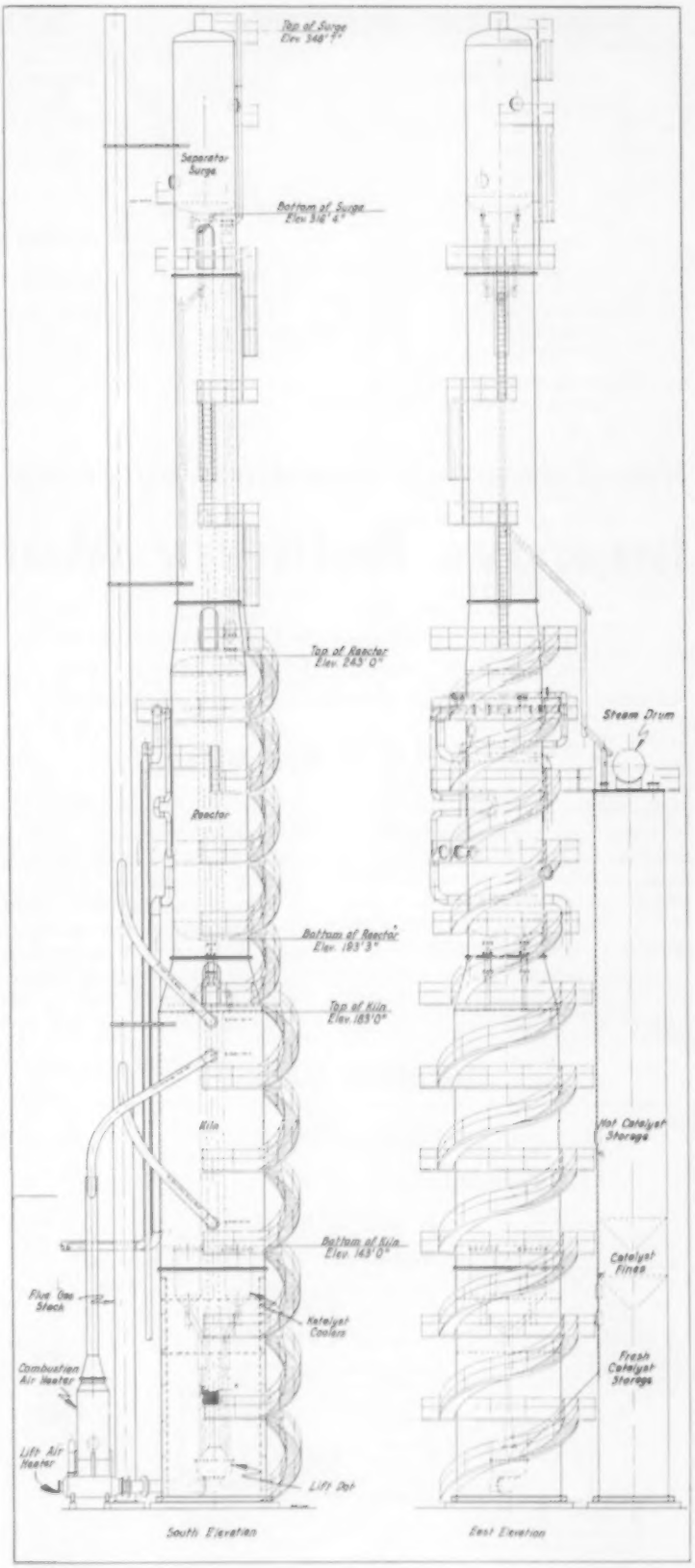
Other design provisions of the main structure include its ability to withstand winds of 125 m.p.h. and a 0.2 seismic factor. The latter requirement is well in excess of any seismic movement yet recorded on the coast.

In designing the structure, ease of transport and erection likewise were given much study. The tower will be fabricated and shipped in five separate sections, or four if a reinforced-concrete structure is to be used in place of the steel skirt at grade. Maximum diameter for shipping will be 20 ft., maximum length 60 ft., and maximum weight of any section will be 182,400 lb.

Erection will be facilitated by means of support brackets provided at the top of the 92-ft. kiln section and the 152-ft. stacked kiln-reactor sections. Twin poles, 100 ft. long and having a 100-ton capacity, will be used to elevate the kiln section, after which they will be jumped to brackets fabricated into the top of the kiln. There they will hoist the 60-ft. reactor section into place. Then, after being jumped to the top of the reactor, they will be used to place the 55-ft. skirt section and 39-ft. surge section in position.

In lieu of the vessels being moved into place after the structural steel tower had been erected piece by piece, it is seen that erection of the Succop structure can be carried out quite rapidly. In order that erection time and costs can further be cut, all possible stairways, platforms, and piping will be in place before each section is moved into place.

Over-all reduction in cost due to this redesigning is expected to amount to 10 to 20 per cent, Succop engineers declared. On a 10,000-bbl. T.C.C. unit, this will amount to as much as a $500,000 savings, they state.



SCHEMATIC LAYOUT for vessels and major connecting lines in proposed new packaged T.C.C. unit.

MAINTENANCE ORGANIZATION

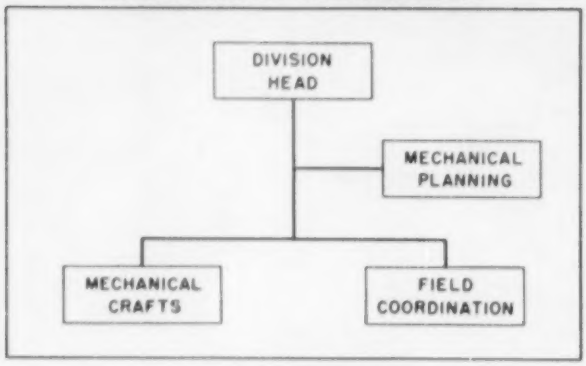


Fig. 1—Original organization.

CHECK LIST

AUTHORITY AND RESPONSIBILITY	CRAFT F'MAN	AREA SUPER.	GEN. F'MAN	REG. ENGR.
PERSONNEL PROBLEMS	(X)		X	
COMMUNICATIONS	X	X	X	X
INDIVIDUAL JOB PERFORMANCE	(X)		X	
SCHEDULING WORK		X		X
PLACEMENT OF MEN		(X)		X
ESTABLISHING JOB PRIORITIES		X		(X)
(X) INDICATES PRIMARY RESPONSIBILITY				

Fig. 3—Authority and responsibility under new organization.

How Esso's field coordinating group functions to

Improve Refinery Maintenance

New plant organization has brought about increase in individual productivity, and promoted coordination of supporting crafts

by E. C. Hermann

ORGANIZATION of a field coordinating group and the consequent redistribution of supervisory maintenance functions have proved extremely effective in the Bayway, N. J., refinery of Esso Standard Oil Co. This is particularly true when handling the small jobs which constitute more than 50 per cent of the maintenance work.

Author is associated with Esso Standard Oil Co., Bayway refinery, Linden, N. J.
Paper presented before Petroleum Division, A.S.M.E., Los Angeles, September 26, 1954.

Besides increasing the individual mechanic's productivity, the plan helped to promote more efficient coordination of supporting crafts. The organization lends itself to good mechanical work planning, since it provides enforcement and results at the level of the job itself.

As the plan was put into operation, it was found that adaptability and flexibility of the individuals involved had been greatly underestimated. Within a matter of weeks, newly appointed planners and area supervisors were constructively discussing the methods used under the new system, and were advocating further refinements and improvements.

FUNCTIONAL ALIGNMENT

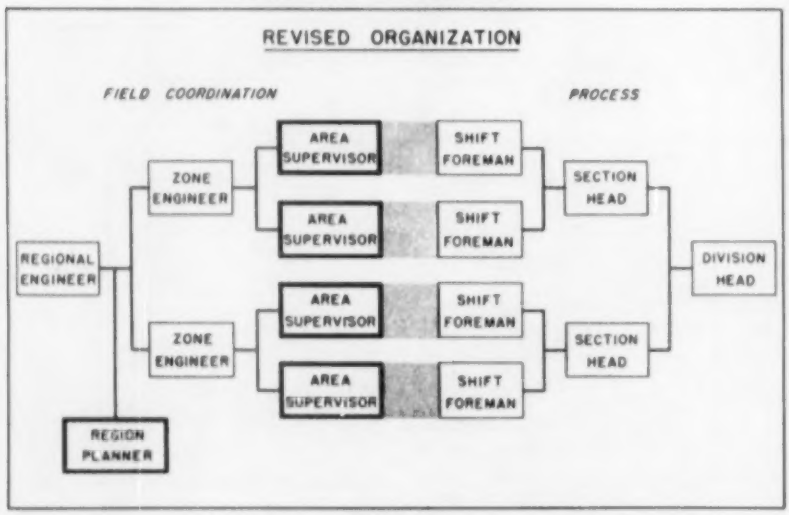


Fig. 2.

Original Organization

The original maintenance organization consisted of three sections; Mechanical Crafts, Field Coordination, and Mechanical Planning (Fig. 1).

Mechanical crafts . . . Each craft group was headed by a general foreman, with two or more zone foremen, each of whom directed the efforts of several first-line foremen. The major function of the mechanical crafts section was to provide trained manpower and the work direction required to perform any mechanical work. Assignment of manpower was under the guidance of the engineers within the field coordination section.

Field coordination section . . . The plant was divided into four geographical regions each having a regional engineer with two assistants or zone engineers. It was the responsibility of this field coordination section to coordinate the daily mechanical work, plan weekly assignments of manpower and to develop better work technique and prevention maintenance programs.

FUNCTIONAL ANALYSIS

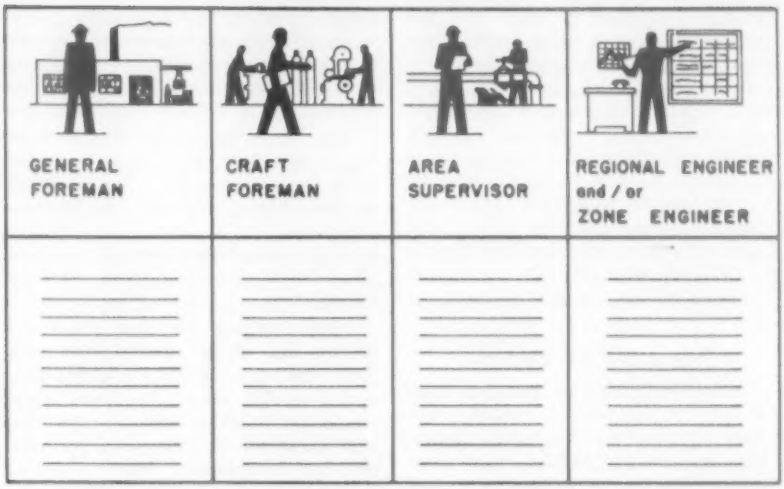


Fig. 4.

While the field coordination section was fairly closely aligned with the process organization, the two groups were not completely parallel owing to a recent rapid increase in the size and complexity of the process operations without a corresponding increase in the field coordination section. The absence of a direct-line relationship between the mechanical crafts section and the field coordination section was the most serious deficiency.

Mechanical planning section . . . Mechanical planning was charged with the responsibility of preparing long-range and intermediate-range work plans, extended period manpower assignment schedules, and predicting required adjustments to the craft balance. This section, operating in a staff capacity, performed many additional studies and analyses related to mechanical activities.

There was considerable overlap of responsibilities among the three sections, particularly in matters of moving manpower, expediting jobs, ordering material, and assigning industrial equipment. This led to confusion and created added problems of coordinating the work effort among a number of the crafts, particularly the lead crafts. Solution of the coordinating problems associated with the day-to-day jobs left the supervisors with insufficient time for any longer range needs such as craft training or improved work methods and programs.

Recognizing the deficiencies in the original maintenance organization led to a careful functional analysis of the components of the maintenance organization and a detailed study of the organizational structure of other industrial plants having comparable maintenance requirements.

Refining Technology

Model Organization

The organizational structure chosen as a model was selected on the basis of its ability to relieve the recognized deficiencies and at the same time be capable of fitting into the over-all organization of the plant in question.

It was decided that the conversion from existing organization to the adopted model organization would best be done in one move, while preparations to meet the objectives of the conversion would be handled stepwise.

The first step was to redivide the plant into physical areas which would be in close alignment with the process organization, while emphasis was placed upon this alignment between maintenance areas and process organization. Consideration was also given to the following:

1. The physical size of the area.
2. The complexity of equipment within the areas.
3. The number of mechanics required for routine maintenance in the area.

The second step was to establish the new position of area supervisor for each individual area. This area supervisor, whose counterpart in the process operation is the process supervisor, was to devote full time to the field coordination of mechanical work within his area, with full authority to give work assignments to the mechanics of all crafts working in his area on routine maintenance (Fig. 2).

By establishing this new position, the zone engineer and craft foremen were relieved of the highly time-consuming responsibility of assigning manpower to jobs, job pushing, and in general maintaining all process equipment in efficient operating condition.

MAINTENANCE LABOR COST AS PER CENT OF PLANT INVESTMENT

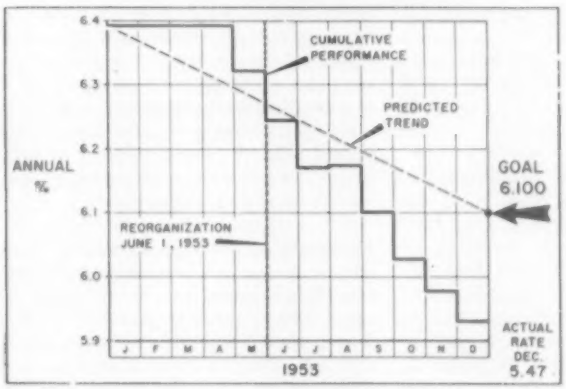


Fig. 5.

MEN ON ROUTINE MAINTENANCE SINCE REORGANIZATION

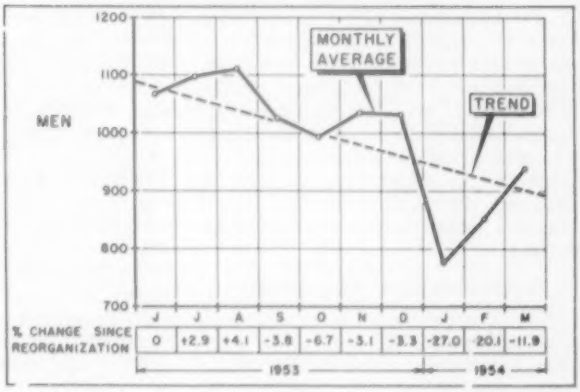


Fig. 6.

Refining Technology

A careful check of the daily activities of each craft foremen indicated that approximately 16 per cent of their number could be transferred to the new position of area supervisor. The remaining craft foremen, relieved of such coordinating duties as manpower assignment to jobs, job pushing, etc., not only could supervise a larger group of mechanics but also devote full time to their primary responsibility of work direction, craft training, and personnel administration. The craft foreman was to assign men to the area supervisor who would in turn allocate them to specific jobs within his area.

Since the job coordination and pushing had been done by the zone engineers as well as the craft foremen, the institution of the area supervisor position would make the zone engineer available for more field engineering and planning work. One zone engineer from each region was designated as "region planner" and assigned full time to work planning. It would be the responsibility of this engineer to work closely with the zone engineers in his region and the other region planners to set forth practical and efficient mechanical work plans. The need for such specific planning was emphasized by the assignment of supervisory functions to two groups—the craft foremen and area supervisors.

The close communication required for detailed planning and coordination between the maintenance organization and the process organization was enhanced by the previously mentioned realignment of the Field Coordination Section to parallel the process organization. The area supervisors, zone engineer and regional engineer with their respective process counterparts, of unit foreman or shift foreman, section head and process division head provides a mutual contact in related responsibilities at each level of both organizations.

The area supervisor was to be housed within his assigned area, preferably in an existing control house or operating plant building in order to provide a single personal contact to supply the "on the spot" service needs of the process operators. His manpower requests would be directed to his region planner. Selection and assignment of mechanics to areas, based upon daily planning direction from the region planners, would be done by each craft foreman.

Redistribution of Responsibility

The organizational structure outlined emphasized the need for a complete functional analysis for the supervisory groups involved. However, to meet the initial requirements, a check list of authority and responsibility was prepared listing the major supervisory functions assigned to each first-line foreman, general foreman, regional engineer and area supervisor (Fig. 3).

Of necessity, the check list could show only the major functions. Specific details in the form of a comprehensive, well-defined functional analysis would have to follow shortly after reorganization to make all supervisory positions clear-cut. The check list would provide a most important initial over-all indication for all supervisors involved, of the change in scope of jobs.

Preparation for Changes

Having once decided upon the basic changes in principle, it became necessary to sell the plan to the supervisors involved and impress upon them their responsibilities, individually and collectively, for making it a success.

The regional engineers and general foremen were brought together in out-of-plant meetings for a detailed review of the problems and the submission of a rough draft of the organizational proposal including the check list of authority and responsibility. Their severest criticism and suggestions were solicited to develop all workable details for the new setup. These meetings proved to be extremely fruitful and the sound practical thinking of both groups was incorporated in the over-all plan.

The concentrated work of this group extended beyond the point of making refinements to the plan, it included the actual selections of candidates for positions of area supervisors. Candidates were selected on the basis of ability and background related to the area involved. For example, an electrical foreman as area supervisor for the power plant area, an instrument foreman as area supervisor for an area encompassing complex operating units, a boilermaker foreman as area supervisor for tank field area, etc.

After a thorough scrutiny by the mixed group, the plan was documented into a reorganization manual that listed all changes, the check list of authority and responsibility, the job description sheets for each position and the operating facilities to be included in each new plant area.

Adoption of plan . . . A communication of the plan to all plant personnel was the next major undertaking. All supervisory personnel (in meetings of 20 or fewer) were presented with the outline of the plan, its objectives, and how mechanical services were to be processed. At these conferences no mention was made of the identities of the new area supervisors or region planners in order to keep everyone alert to determine "who does what" and to solicit more ideas for incorporation. A similar meeting and discussion period was held with the union officers and representatives outlining in considerable detail all factors related to their interests.

After 3 months of development, refinement, and training, personnel in the plant were considered to be ready for the adoption of the new maintenance organization. Candidates for the new positions were interviewed individually, and it was indicated why they had been selected.

Thus groomed, the final phase was to acquaint all personnel, particularly the wage-earner group, with the new organization, since the mechanics would be working directly for and with the area supervisors in performing job assignments. Their relationship with the area supervisor and the craft foreman had to be spelled out clearly to prevent serious misunderstandings. A 15-page illustrated cartoon booklet entitled, "Who's the New Guy in the Picture" was prepared to explain what the new system was intended to do and how it would apply to the individual wage earner. This booklet was distributed to all plant personnel several days in advance of the conversion date.

Office facilities were provided for each area supervisor within his assigned area, either in an existing control house or in an operating plant building. The region planners developed the planning forms manpower assignment sheets, and duplicating facilities necessary to elaborate and expand upon mechanical work-planning procedures.

On June 1, 1953, the new maintenance organization went into effect. The relative smoothness of the transition precluded the need for post reorganization meetings that originally had been considered for discussing and resolving problems. Some anticipated minor misunderstandings and misinterpretations of the new functions did occur, and required some attention. In some cases the craft foremen were concerned about the reassignment of some of their authority and responsibility; however, most of the foremen immediately took advantage of the opportunity provided by the reorganization to concentrate on their primary duties—administration and training.

Functional analysis . . . Experience confirmed that in an organizational structure based upon the reassignment of supervisory functions there is an inherent need for a comprehensive and clear-cut designation of functions and responsibility. No system can tolerate unassigned or overlapping responsibili-

ties. After 3 months of operating under the new system sufficient experience had been gathered to start the preparation of a detailed functional analysis covering the reassigned duties and responsibilities known or anticipated for each supervisory position in the maintenance organization.

Two pilot groups each consisting of a craft foreman, an area supervisor, a zone engineer and a training foreman were formed and the discussional technique was employed to gather information. The development period required 6 months for completion, with results culminated in a 200-page loose-leaf manual to be used as a reference by all mechanical supervisors. Functions and responsibilities were grouped according to their relation to People, Work Planning and Manpower Allocation, Work Direction, Tools and Equipment, and Supplies and Materials (Fig. 4).

Results

Nine months after adoption, definite changes in mechanical work performance were seen. All indications were that the over-all mechanical work efficiency had increased in the order of 20 per cent. Operating personnel indicated that the area supervisor was the readily available service man they had always needed. Improvement in mechanical efficiency was reflected in improved maintenance performance with a corresponding decrease in the number of manhours required for maintenance work (Figs. 5 and 6).

While the over-all results of the reorganization did bring about a general increase in efficiency, there were several unanticipated adjustments that required immediate attention. Several of the areas turned out to be far too large for the area supervisor to handle properly. This was particularly true in the tank field area.

The mechanical work performed in each of the several maintenance shops being centralized and of a highly specialized nature, as contrasted with field work, represented a special case for area supervision. Here the area supervisor was instructed to work through the shop craft foreman rather than deal directly with the individual mechanic to administer planning, scheduling and the expediting of shop work.

A third refinement was the establishment of a rotational plan between qualified craft supervisors and area supervisors. Under this arrangement various craft foremen are selected from time to time to replace area supervisors on vacation, or absent due to sickness. This provides the craft foremen with an opportunity to learn of the problems associated with area supervision and to have a better understanding of its function.

S.E.G. Will Hear These Subjects

The Society of Exploration Geophysicists will hold its eighth annual midwestern meeting November 18 and 19 at the Adolphus Hotel, Dallas. Principal speaker for this event will be Dr. James Boyd, exploration manager of Kennicott Copper Co., New York. Dr. Boyd, former head of the U. S. Bureau of Mines, is well known in exploration and geophysical circles and will speak on "Geophysics in an Expanding Economy."

The convention is devoted primarily to geophysical activities, and the sessions will cover new developments in exploration techniques, management of exploration activities, uranium exploration, and geophysical case histories. The technical sessions begin at 9 a.m. Thursday, November 18, and Friday, November 19. Listed here are selected abstracts of the papers that will be presented.

The Reynolds Plotter

VINING T. REYNOLDS, Geophysicist, Houston, and **PAUL FARREN,** National Geophysical Co., Houston.

A SYSTEM of seismic trace analysis is presented which mechanically identifies, times, corrects, computes, and plots in cross-section form every event on a seismic record. Normal moveout; weathering corrections, elevation corrections, and velocity depth functions are applied to each trace individually as all traces are scanned and reproduced simultaneously by a mechanical process.

Benefits of the system might be listed from two viewpoints. First, as a plotter, the system produces cross-sections plotted with speed, thoroughness, and accuracy. Second, as an interpretational tool, the system by the speed and convenience in correlation of the seismic sections, expands the output of the interpreter; by flexibility in handling the mass of data available, it facilitates special projects such as velocity and isopach studies; and by thoroughness of presentation of all events, especially segmental reflections, it permits a more valid interpretation.

Magnetic Exploration By MoMag*

W. T. GRISWOLD, United Geophysical Corp., Pasadena, Calif.

THE introduction of the automatic recording total intensity mobile magnetometer has greatly increased the rate at which certain types of magnetic surveying may be carried out. This unit, known as the MoMag, is mounted on a heavy-duty four-wheel-drive vehicle and is suitable for operation under a wide range of field conditions. However, greatest efficiency is obtained in operations along roads. Under suitable conditions, surveys can be made at speeds as high as 40 m.p.h. and the cost per survey mile is lower than any other magnetic surveying method.

MoMag surveys have been particularly valuable in locating and outlining mineralization associated with magnetic deposits. Due to the frequent occurrence of magnetite as an associate mineral in high-temperature fissure veins and contact replacement deposits, ore minerals of such metals as copper, lead, zinc, tungsten, and molybdenum may be found. The unit is also valuable in delineating fault zones, basement highs and lows, intrusive sedimentary contacts, sub outcrops of basic dikes or bedded volcanics, buried volcanic flows, regional dips and strikes, and hydrothermal alternation zones.

*Trade mark of United Geophysical Corp.

Use of Magnetic Method In Searching for Stratigraphic Traps

JOHN D. HASEMAN, Linton, Ind.

A PROCEDURE is described by which very accurate corrections can be made for the local effects of regional maximum and minimum vertical magnetic intensities, thereby permitting a closer correlation between magnetic anomalies and geologic structure.

It is postulated that variations in the circulation of earth currents resulting from geochemical differences associated with dry and oil-bearing horizons produce a measurable change in the magnetic vertical intensity which can be used in prospecting.

Some examples are presented which indicate that under certain conditions the value of vertical magnetic intensity might vary at a particular point, but the pattern of magnetic intensity remains the same.

Instruments and Techniques For Measuring Radioactivity In the Field

FRANK STEAD, U. S. Geological Survey, Denver.

THE principal emphasis of the U. S. Geological Survey's investigations in the field of radioactivity has been placed on the development of instruments and techniques and rapid field measurement of radioactivity. Some current activities include the development of portable radiation-detection equipment, gamma-ray logging of exploratory drill holes, original-state core studies, and airborne radioactivity surveying. Significant progress has been made in instrumentation and techniques; however, considerable research must be done to place field measurements of radioactivity on a quantitative basis.

A Personnel Training and Development Program For Geophysicists

H. R. PRESCOTT, Continental Oil Co., Houston.

GEOPHYSICS is a young profession created by people attracted from numerous allied fields in engineering, geology, physics, and mathematics. The development

of these people into mature geophysicists has largely been an informal process. There appear to be some advantages in a more formal approach to personnel training and development in the industry in order to supply future needs.

Safe Handling and Use of Explosives In Seismic Operations

LINDLEY LATHUM and **NORMAN G. JOHNSON**, E. I. du Pont de Nemours & Co., Wilmington, Del.

EXPLOSIVES can be used safely if fundamental regulatory precautions are established, explained, and enforced. This paper is a discussion of suggested safe practices and comments on hazards in the use of explosives on conventional, pattern, offshore, and experimental operations. Safe storage, transportation, and handling of explosives and shot point and shot boat procedures will be described.

Atmospheric Electricity and Geophysical Operations

GLENN W. FORDHAM, Atlantic Refining Co., Dallas.

LIGHTNING has caused occasional loss of life directly by a strike and indirectly by a premature detonation of dynamite. Corona currents resulting from high potential gradients in the atmosphere have been measured using a point collector, in the hope that a simple device giving some degree of prior warning of imminent flash can be developed. Continuous recordings have been taken of corona currents during thunder, snow, and rain storms.

Simultaneous Gamma Ray And Resistivity Logging As Applied To Uranium Exploration

R. A. BRODING and **BEN F. RUMMERFIELD**, Century Geophysical Corporation, Tulsa.

THE transferring of petroleum exploration thinking and methods to uranium exploration has greatly facilitated the search for radioactive ores. The application of radioactive and resistivity logging to locate mineralized zones in shallow core holes obviates the need and expense of taking continuous cores. Instrumentation, field equipment, and techniques are discussed.

A Study of Gravity Response Within Certain Gravity Provinces of Texas, Louisiana, and Mississippi

CLARK MAYHEW, Union Producing Co., Shreveport.

THE efficiency of an oil and gas exploration program often can be improved by the use of gravity surveys. The amount of improvement varies with areas and because of its empirical nature is difficult to determine. However, the importance of knowing the probable value of gravity coverage in a given area justifies even an approximate analysis of the situation.

From the region of Texas, Louisiana, and Mississippi, we have outlined six areas containing Bouguer gravity anomaly prospects of similar character, designating these as "gravity provinces." For each such province, there is described a statistical analysis of gravity response over known oil and gas fields. A probability ratio computed for each province shows the relative value of gravity work as a reconnaissance method.

Refraction Sesimograph Techniques in South Florida

ALEX E. BLOMERTH, Gulf Oil Corp., Fort Myers, Fla.

THIS paper deals with the operational techniques of a refraction seismograph party in South Florida using two recording units. A brief discussion is made concerning the general geology and topography of the area. Procedures and problems of the recording, surveying and permitting, drilling, transportation, and communications are presented. A short dissertation is made concerning velocities and interpretation.

Making Use of Seismic Record Morgues

H. B. PEACOCK, Consultant, Dallas.

THE original cost of seismic records in storage vaults is estimated and an attempt is made to place a present-day evaluation on them. The extent to which old records are being used and the methods applied are discussed. Some factors limiting the usefulness of these records are pointed out and suggestions are made for correcting the deficiencies. The effect of magnetic tape recording on the storage problem is mentioned. Mention is also made of the recently organized "Record Bank" for the purpose of trading seismic records on an exchange basis.

Geophysical History Of Elkhorn Field, Crockett County, Texas

J. E. FINLEY, Continental Oil Co., Midland, Tex.

THIS paper reviews the refraction and reflection geophysical surveys employed in the exploration and development of the Elkhorn Field. Map interpretations and cross-sections are presented and discussed. The results and limitations of both the reflection and refraction work are pointed out and actually compared to subsurface conditions.

Exploration History of Block 12 Area, Andrews County, Texas

J. H. DEMING and **L. O. DAILEY, JR.**, Atlantic Refining Co., Dallas.

THE authors review the general history of the Block 12 area, Andrews County, Texas, from the first geologic interest in the area in 1920 to the present time. Successive torsion balance, gravimetric, and seismic mapping are presented and discussed. Subsurface geologic mapping and a geologic cross-section based upon well control are also presented with a summary of the generalized stratigraphy.

The authors call attention to a seeming correlation between progressive changes in reflection character and truncation of geologic markers.

Case History of Elk City Field

R. F. CHRISTY, Shell Oil Co., Tulsa.

ELK CITY field is in 10n-20-21-22w, Beckham County, Oklahoma. The history of the geophysical exploration leading to the discovery is presented.

Shell Oil Co. entered the area in 1945 after seismic work had been done by several other companies. A dry hole, the deepest well in Oklahoma at that time, had been drilled on the structure in 1940. The presentation of data includes seismic records, profiles, and maps on two horizons as well as an up-to-date subsurface map.

Case History of Smallwood Pool, Stafford County, Kansas

B. W. BEEBE and **A. L. BALLOU, JR.**, Manhart, Millison & Beebe, Tulsa.

SMALLWOOD pool was discovered in August 1951, as a result of a seismic survey conducted in a manner in which the geological and geophysical data were completely coordinated throughout the extent of the survey. This discovery is unusual in that prior to 1951 numerous operators conducted seismic surveys which apparently overlooked the pool in an area of excellent seismic reflection data that are very accurate if proper interpretation techniques are applied.

The scope of this paper is to outline the seismic and geologic problems and to discuss the techniques used in exploring and evaluating the Smallwood and other similar areas where structural relief is very low and a high degree of seismic accuracy is required.

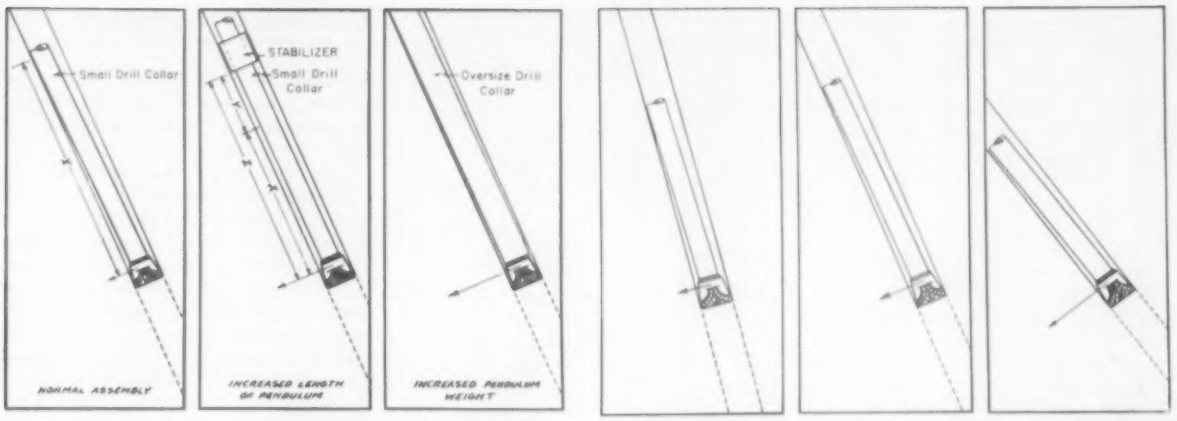
The Devonian Problem

JOHN DALY, Consulting geologist and geophysicist, Midland, Tex.

A GENERATION of geophysicists has been weaned on the continuous profiling method which, for the purpose of mapping the Devonian formation, is not completely salutary, for this formation is severely faulted and reflections from it are not consistently continuous. There is a tendency to force continuity where none exists. The principles for mapping the Devonian formation, enunciated herein, can be applied equally well to the mapping of any faulted strata.

The first step is the identification of the reflection, which is achieved by means of velocity surveys, and allowance must be made for the lag in time of the reflected event.

The second step is to discern when a fault is crossed and the third is to recognize the same event after this has occurred. Good records facilitate accomplishing the second and reflection character is a requisite for solving the third problem.



Increasing straightening force by changing drill-stem assembly.

The greater the hole angle, the greater the straightening force.

Fig. 1.

Proved programs can help you to

Lick Those Crooked-Hole Problems

Crooked hole can best be handled through planning. Oftentimes, the contractor can find out beforehand where the hole will go off, how severe it will probably be, when the hole will straighten, and what size hole must be drilled. Then, a proper selection of drill-collar size with placement of stabilizers and reamers will greatly reduce the cost per foot.

Present methods of drilling crooked-hole formations are all based on merely straightening the hole, and are questionable in their effectiveness. A planned, scientific approach to the crooked-hole problem through the use of the Lubinski and Woods charts can in most cases result in lower drilling costs. Although great improvement is made in many cases there are still cases where the conditions are so severe it is necessary to drill with light weight. It is now possible for the contractor to determine if he is drilling in such a formation. If it is severe, he can drill it as such and be satisfied, for experimenting will only cost more money and may lead to trouble.

by R. J. Bromell

THE use of increased weight on the bit to obtain faster penetration rates has increased the problem of maintaining a straight hole within contract deviation limits. In many cases the formations in which it is most difficult to control deviation are those which cannot be drilled economically with light weight. It is not uncommon for the cost to drill such formations to be as high as $200 per foot.

Author is engineer with Great Western Drilling Co., Midland, Tex. Paper presented at Los Angeles A.A.O.D.C. meeting, October 13, 1954.

Recently, a series of controlled tests was made using new drilling techniques based on available technical data,[1] geological, and other drilling information. Although oversize drill collars (collars which have insufficient clearance in the hole to washover) have been tried for some time, little effort has been made to analytically evaluate their effectiveness. Practical results of these tests largely confirm and correlate with the charts prepared by Woods and Lubinski[1] and illustrate the usefulness of these theoretical data.

The practices which evolve from these tests included the use of stabilizers and reamers for which there were no published theoretical data. Mathematical analysis of the placement of stabilizers has since been made and results closely approximate the positions found in practice to be desirable.

To the practical man engaged in drilling a well, the hole becomes "crooked" when he is forced to retard drilling as a means of keeping vertical deviations within contract limits. Throughout this article "crooked hole" shall carry this same meaning since we are concerned with actual drilling progress and the effect of application of technical knowledge.

Experimentation tried . . . Until recent years little work had been done to correlate crooked sections of neighboring wells. Each well became a new experience and various methods of controlling vertical deviation were used, each as a new experiment, to "try it and see what happens." Since no relationship had been established among crooked holes, and certainly no relationship between drilling equipment and crooked holes existed, results of these experiments varied widely. What was successful in some cases often proved disastrous in others. This could and should have been expected.

Until recently, no means existed to diagnose the severity of a crooked hole so that the correct combination of drill-

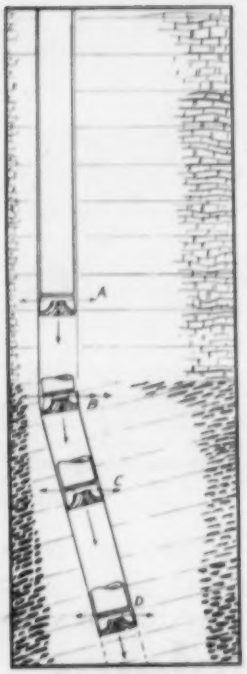


Fig. 2—Increase in deviation and establishment of new equilibrium condition after change in dip.

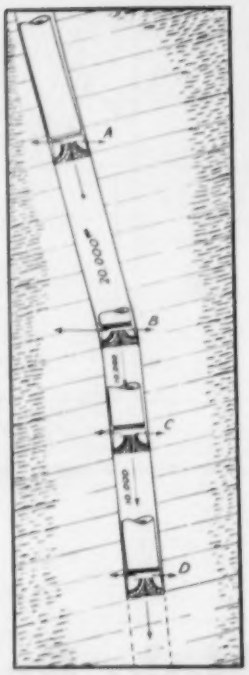


Fig. 3—Reducing hole deviation by reduction in weight on the bit.

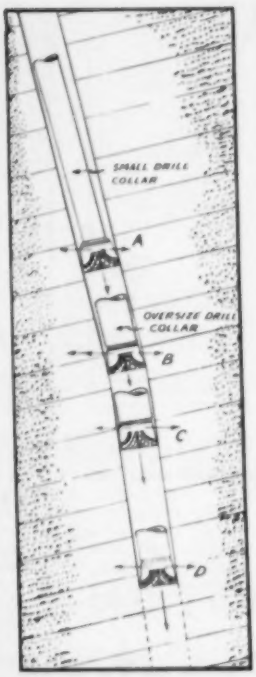


Fig. 4—Reducing hole deviation by increasing pendulum weight.

collar size, weight on the bit, and stabilizer application could be specified to relieve the crooked hole in question. Such things as changing bit types; deleting teeth from bits; deleting cones; using limber members on the bottom of the drill stem; stabilizing; reducing hole size, and then reaming to the desired size; running light weight and then suddenly increasing weight—all these things have been tried. With the exception of stabilizing, the effect of any of these methods is questionable and experience has shown that the results cannot be predicted or reliably repeated.

Saving can be made . . . There is no known method by which crooked holes can be economically eliminated. The cause of crooked hole, however, and the effect of drill-collar size, weight on the bit, stabilizers, and related factors have been analyzed mathematically. This information makes it possible to approach the crooked hole as a scientific problem instead of another unplanned experiment.

When provided with a knowledge of the area in question a practical man can now plan to drill with confidence. The well to be drilled can be classified according to its severity and the best known methods can be employed to combat the situation. Prior planning, utilizing available data, is now possible and is indeed essential to economically drilling through crooked zones.

Why Holes Are Crooked

It is assumed that drill collars will lie on the low side of the hole as hole deviates from vertical. The drill collars act as a pendulum from the point of contact with the wall of the hole to the bit; this length, supported only by the bit, tends to swing toward vertical. This tendency applies a lateral force on the bit which causes the bit to cut sideways and act as a "hole straightening" force. The amount of this force can be increased by (1) lengthening the "pendulum" section, (2) increasing the weight of the penedulum section, or (3) by increasing the angle from vertical. These variations are illustrated in Fig. 1.

The forces acting . . . The forces, which determine the hole deviation and drilling progress are: (1) the weight on the bit, (2) the reaction of the formation tending to deviate the hole, and (3) the straightening effect of the drill-collar pendulum trying to return to vertical. These forces are shown in Fig. 2.

If the forces are in lateral balance, the hole angle will continue unchanged as is shown at point A. A change in deviation must be preceded by some change in the direction or strength of the forces at the bit, as occurs at point B. These forces can be thrown out of balance by increasing or decreasing the bit weight, by changing drill-collar size, by stabilizing, or by a change in formation characteristics.

A change of formation . . . In a near-vertical hole, such as shown in Fig. 2 to point A, the bit moved downward since the lateral components of the forces were in balance. When the bit reached point B the horizontal reaction of the formation tending to push the bit away from vertical was greater than the straightening force of the drill collars and the hole started to deviate from vertical. By the time point C was reached the straightening force of the collars had increased as the hole angle increased until the lateral forces were again balanced.

The section from point C to point D is straight though inclined, which means that a state of equilibrium has been reached and no change in angle will take place until the lateral balance is changed.

With a change in weight . . . A change in hole deviation obtained by a change in weight is illustrated in Fig. 3. As the weight was decreased the lateral forces became unbalanced, the pendulum force of the drill collars being greater than the horizontal reaction of the formation, and the hole started to straighten. At point C the lateral forces once again balanced and the hole remained straight while drilling progressed to point D. In this case drilling progress will be retarded as bit weight has been decreased in order to reduce hole angle.

Large collars can do it . . . The same effect can be obtained by substituting larger drill collars, which increases the pendulum force of the drill collars and reduces the hole angle until a state of equilibrium is reached, as illustrated in Fig. 4. At point C the forces have again become balanced and the hole will continue at this angle. Note that in this case drilling progress is not retarded as the bit weight remains constant, but reduction in angle is accomplished by increasing the pendulum effect of the drill collars.

A similar result can be obtained by using a stabilizer with the small collars to raise the point of contact of the drill collars with the wall of the hole, as shown in Fig. 5. The pendulum length is shown as distance Y without the stabilizer and is increased to distance X by use of a stabilizer. The increase in the length of the collars acting as a pendulum increases the force tending to return the collars to the vertical position. As the hole is drilled from point B to point C the deviation decreases and the lateral balance is again established. Again, drilling progress has not been retarded, as the hole angle has been decreased without reduction of the weight on the bit.

Drilling Technology

How Doglegs Are Made

Production departments of some oil companies producing from wells with large deviation angles, no longer consider hole deviation in itself to be detrimental. Some confusion and misinformation still exist among those not familiar with such practices and the old standard of 3° or 5° maximum deviation are still misleading criteria.

Production or drilling troubles caused by sudden changes in direction frequently have been blamed on high deviation angles. Wells drilled to a graduated deviation limit which increases as depth increases are costing operators thousands of dollars unnecessarily. A careful study of producing wells with high deviation angles and controlled rates of change should be made and contract procedures examined to determine if the present specification of maximum hole angle is penalizing the producer.

A 3° maximum can be costly . . . Strict adherence to small deviation angles may in some cases penalize the producer in two ways. Forced light weight to maintain small angles raises the cost per foot and the producer must eventually pay this increased cost of drilling. In cases where the hole angle rapidly approaches the contract limit, the producer pays for and sometimes insists on drilling practices which result in a dogleg being formed in the hole. Naturally, no one specified that a dogleg be put in the hole but through a diligent effort to keep the hole straight the deviation is held within limits only by a drastic reduction of weight.

A misunderstanding as to what actually causes trouble in a producing well has led to a false feeling of security in maintaining small deviation angles. Certainly, deviation angle is important but it is by no means the only important factor and should not be used as the sole guide by which to judge the ability of a well to produce trouble free. These various factors have been under study and new methods to define crooked hole for contract purposes have been proposed.[2]

If weight changes abruptly . . . Fig. 6 has been drawn to clarify what happens when abrupt changes in weight are made to control hole deviation. It is apparent from this illustration that even though the desired hole angle was maintained, the well bore was not as trouble free as might be expected. In a hole approaching contract limit, point A, a large reduction in weight has been made, a dogleg formed, and a smaller deviation reading obtained at point B. Reduction in hole angle has stopped at this point because the collars touched the wall of the hole at a point close to the bit and the straightening force is lost.

The hole will continue to drill at this angle until point C, when the pendulum length of the collars increases enough to produce a straightening force which will overcome the formation reaction. The hole then gradually straightens until the equilibrium condition is reached.

In more severe zone . . . Fig. 7 illustrates a variation of this condition in a more severe crooked-hole zone. When the dogleg was formed and the drill collars contacted the wall of the hole near the bit, the pendulum force was lost and sufficient formation reaction existed to actually increase the hole deviation slightly. If the hole is permitted to progress the formation's force will be overcome by the increase in pendulum effect of the collars and a new equilibrium will be established.

The new deviation established will be greater in Fig. 7 but in both Figs. 6 and 7 better results could have been obtained without the hazard of the dogleg by a gradual reduction of bit weight. Often the tendency is to lighten the weight even further if a deviation survey is made showing the hole angle to be increasing slightly after the dogleg is formed in the case of Fig. 7. This practice costs even more money since a reduction in weight will generally slow the drilling rate.

Light weight, then heavy . . . Many field men can remember places where a hole was straightened by "fanning bottom" and then "throwing the weight to it" after recording an indication that the hole is beginning to straighten. In several cases which have been examined the situation paralleled that illustrated in Fig. 8. After a long period of various experimental operations which carried drilling progress to near the lower edge of a crooked-hole zone, lightweight operation was tried and the dogleg was formed.

After getting a slight reduction in hole angle the weight was increased to several thousand pounds per inch of bit diameter. Drilling progress immediately increased and when point B was reached the formation had changed and lateral force of the formation was very much reduced. The hole angle reduced to near vertical and the hole is said to have been straightened by weight. This was the actual case in several instances examined.

Doesn't always work . . . One other actual case is illustrated in Fig. 9. This situation was similar to that shown in Fig. 8 except that a considerable sec-

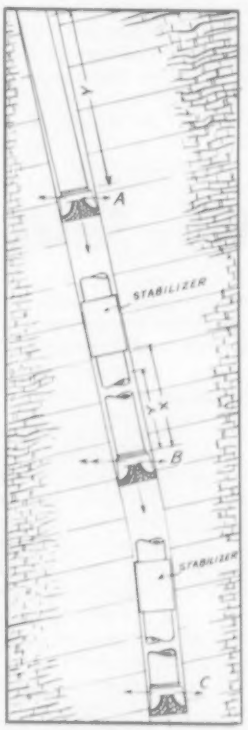


Fig. 5—Reducing hole deviation by increasing pendulum length.

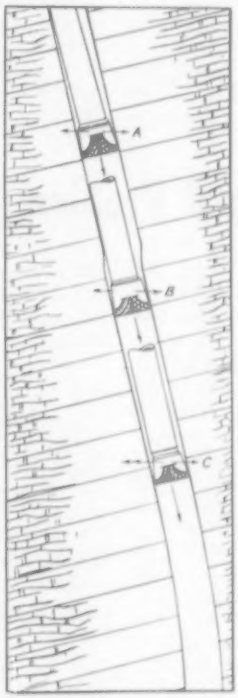


Fig. 6 — Formation of a dogleg by rapid reduction in weight on bit showing eventual reduction in hole angle.

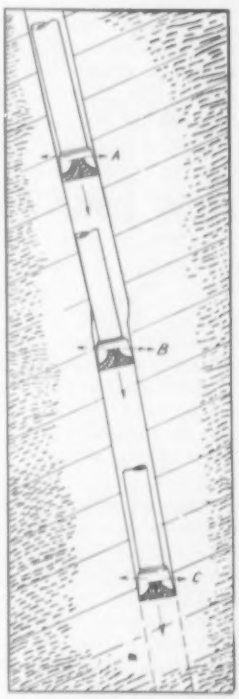


Fig. 7 — Formation of a dogleg in a more severe crooked-hole zone showing slight increase in deviation angle.

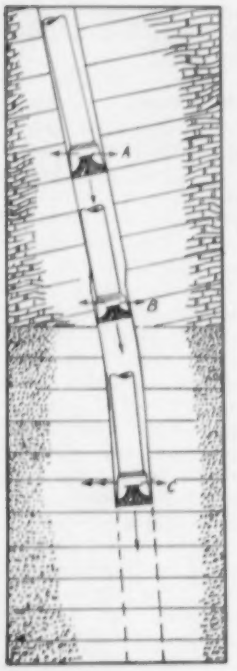


Fig. 8—Hole straightening after increase of bit weight near bottom edge of a crooked-hole zone.

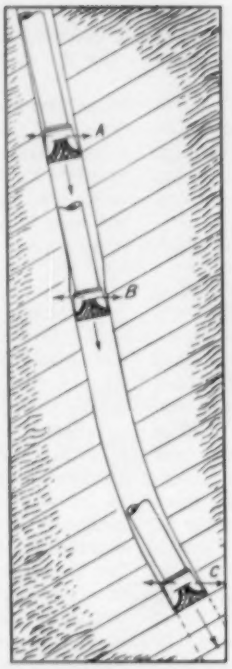


Fig. 9—Effect of increased bit weight when a considerable section of crooked hole remains to be drilled.

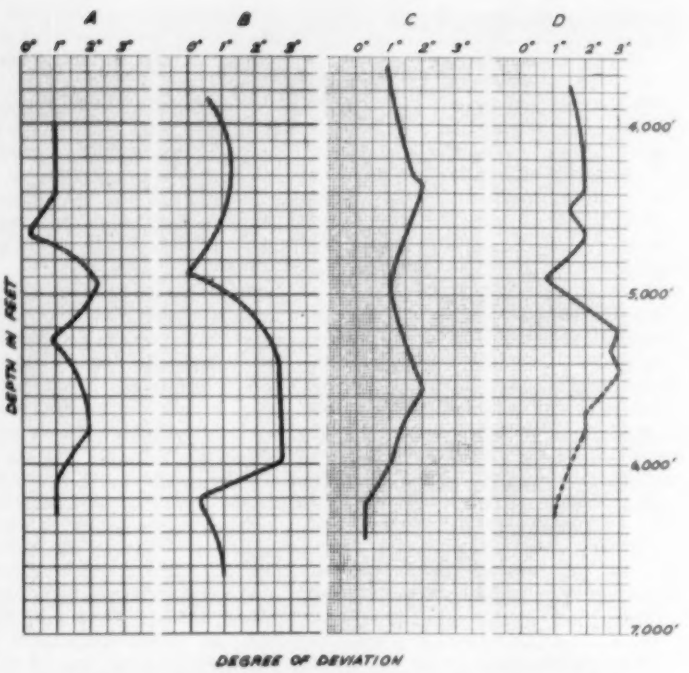


Fig. 10—Plotting known data to determine extent of crooked zones.

tion of the crooked zone remained and the hole angle went to 9°. This is an actual case in which the weight failed to straighten the hole.

Apparently the trick to straightening a hole by increasing the weight lies in knowing when the formation will change. In many cases this can be planned and the drilling rate profitably increased while approaching the formation of lesser dip.

In all of the illustrations on doglegs it should be noted that the size of the dogleg and the rate of change of hole deviation will be much less for large drill collars as they will touch the hole wall sooner as the bit cuts sideways.

How Four Actual Problems Were Solved

MANY cases where theoretical data have been confirmed by actual results are available and a few have been selected to illustrate certain types of problems and how they were solved.

When dealing with basic laws of mechanics and physics the same results will be obtained if the laws are adhered to, regardless of the locality. A rock bit and drill collar have no way of knowing where they are and it is foolish to assume that this system is workable for West Texas but not for the Rocky Mountains; that it works for hard-rock country, but not in coastal areas.

In preparation for drilling crooked hole learn all possible about the area; the depth, thickness, and severity of crooked zones. After this has been done the best equipment for the job can be selected, the program planned, and the hole can be drilled as economically as possible for the conditions which exist.

Example 1

Two rigs were moved into a new field where limited information was available. The records available did not show any severe crooked-hole sections so no preventive measures were taken. Crooked hole was encountered with rig A, but it was not severe. Rig D hit the same zone and found conditions were more severe and difficult to drill. Fig. 10 shows depth versus hole angle for rig A and the other two wells which had been drilled. This graph was made only to show the depth at which deviation changes could be expected and ignores all other factors such as changes in drilling practice.

It was noted that in each of these three wells the deviation angle increased at 5,200 ft. and in each case returned to near vertical at 6,100 ft. The well rig D was drilling was plotted next to the other curves and it, too, showed an increase in angle at 5,200 ft. It was then reasonable to assume that it would start to lose angle as it approached 6,100 ft. The weight was gradually increased from 5,000 to 20,000 lb. in the lower portion of the crooked-hole section and the drilling rate was increased from 2.56 to 13.2 ft. per hour.

Weight applied early . . . By predicting where the hole would straighten, heavy weight could be run through a zone when normally light weight would have been carried. Starting the heavyweight program at the maximum deviation of 3°, as indicated by the broken line in Fig. 10, well D, the hole had returned to 2° at the end of the first bit run and continued to reduce angle to 1° as drilling progressed.

These first two wells (A and D) required an average of 62 bits, 60 days, and 720 rotating hours. With proper planning and accumulated knowledge of the area, wells are now drilled with 40 bits, 42 days, and 535 rotating hours, a saving of 22 bits and 18 days.

From the Woods and Lubinski charts it was determined that 8¾-in. hole using 8-in. drill collars would be more economical to drill than the 7⅞-in. hole, 6-in. drill-collar combination used on the first two wells. Calculated on a basis of 3° maximum deviation, 15,000 lb. was carried with the 6-in. collars in 7⅞-in. hole and 34,000 lb. could be carried with 8-in. collars in 8¾-in.

hole at the same deviation. Actual drilling in this field with 35,000 lb., 8-in. collars, and 8¾-in. hole produced a maximum deviation of 2¼°, which was reached after most of the section had been drilled. The 35,000-lb. weight was used to drill the entire section and the hole was free of doglegs.

Reamers are used . . . In this area electric logs and sample descriptions have been used to correlate the wells and when crooked zones are approached in drilling, reamers are placed just above the bit to retard the rate at which the hole gains angle. It is accepted that the hole will be allowed to approach the maximum contract angle since the most economical drilling rate will be at the maximum weight usable to establish equilibrium just under the contract limit.

To retard the rate at which the hole gains angle permits more hole to be made under heavy weight conditions before weight must be reduced to establish equilibrium near the contract limit. No set rule can be made to say when reamers should be used or stabilizers moved in the string. Proper use of these tools comes from field analysis experience. An excellent knowledge of the crooked-zone formation is necessary properly to evaluate results. The presence or absence of reamers can have a profound effect on drilling angle and rate of change of this angle.

Three crooked zones exist in each hole drilled in this area and similar solutions have been applied to each zone. The savings mentioned are cumulative for all zones and not for the one zone shown in Fig. 10.

Example 2

Records available in two wells drilled in Gaines County, Texas, showed a marked tendency for the wells to deviate at approximately 6,300 ft. The most severe section came at approximately 7,800 ft. but the entire interval from 6,300 to 8,400 ft. had to be drilled with light weight. An analysis was made of the hole size, weight on bit, drill-collar size, and hole deviation through the section in question. The Lubinski and Woods curves were utilized and an estimate made as to how much faster the well could be drilled with oversize collars. Table 1 presents a tabulated account of what was done.

Thirteen days and twenty-two bits were saved by using the oversize collars and drilling at maximum deviation angle. The most rapid rate of penetration will be obtained when the hole angle is near the contract limit. To reduce the weight and straighten the hole only results in slower penetration and greater cost per foot. Why drill with light weight and maintain 1° or 2° when the drilling rate can be increased while maintaining and controlling deviation at 3° or even 4°? Once the equilibrium angle is obtained, the hole is under control; that is, to increase weight slightly increases the hole angle and conversely, to decrease weight decreases the hole angle.

TABLE 1

Well—	Hole size (in.)	Collar size (in.)	Weight (lb.)	Maximum deviation (degrees)	Bits through zone	Days through zone
A	7¾	5¾	22,000	4	63	66
B	8⅝	5¾	18,000	3	*58	45
C (Calculated)	8¾	8	47,000	4	(?)	30
C (Actual)	8¾	8	40,000	3	42	32

*Four diamond.

Hole in equilibrium . . . In the first two wells listed in Table 1 the contractors actually did establish equilibrium. They continually reduced weight and found that they had to maintain a large angle and comparatively heavy weight to drill the hard formation. Several runs were made with the same weight and the hole remained at the same angle which means the hole was in equilibrium.

The small collars offered a small straightening force and consequently the weight had to be reduced. The Lubinski and Woods charts offered a means of calculating the effect of using larger drill collars and increasing the pendulum effect. Larger drill collars permitted more weight on the bit while keeping the hole in lateral equilibrium at the same deviation angle.

Example 3

A well in the Rocky Mountains was being drilled with 6-in. drill collars in a 9-in. hole. The formation was known to dip 30°. At a depth of only a few hundred feet the hole was off to 4° and the weight had been reduced to 4,000 lb. Every known bit type and construction was used, including two-cutter, three-cutter, four-cutter, and diamond bits. In 24 days, 1,747 ft. was drilled, using 40 bits, including diamond bits. Four degrees deviation was still held with 8,000 lb. of weight.

It was calculated from the Woods and Lubinski charts that with a 5° deviation and 8-in. drill collars, 17,000 lb. could be run. Permission was obtained to try this procedure. Two 8-in. collars were run immediately above the bit with 6-in. collars completing the string, and 17,000 lb. was placed on the bit.

Results with big collars . . . Eight days later 857 ft. had been drilled with 13 bits and the hole was at 4¼°. At this point the operator chose to try to straighten up the hole. The 8-in. collars were removed and lightweight operation resumed. The final result at this writing was the establishment of a 5° to 5½° deviation angle. Twenty-three bits had been used to drill 1,019 ft. Bit usage had been higher due to the practice of reducing the hole size and then reaming to full size. Table 2 is a presentation of the progress on this well.

Many wells such as the one described above are being drilled every day. Can we truly justify the expense of trying to drill a straight hole in areas such as this?

Example 4

Stabilizers are being used to increase the straightening force of the drill collars by increasing the distance between the bit and the point at which the drill collar contacts the side of the hole. The distance the stabilizer is placed above the bit depends upon the hole size and the collar size. When trying to obtain the maximum straightening effect with 6¼-in. collars in a 7⅞-in. hole the stabilizer was found to be very effective at 68 ft. above the bit. Unpublished theoretical data show optimum distance above bit to be 73 ft.

While drilling a crooked 7⅞-in. hole with 6¼-in. drill collars the hole was in lateral equilibrium with 15,000 lb. of weight at 3°. A stabilizer was placed in the string and the same weight carried on the bit. The hole now stabilized at 2°. A weight of 20,000 lb. was placed on the bit and the hole stabilized at 3°. Several changes were made in the weight and stabilizer arrangement and it was found that 5,000 lb. additional weight could be carried on the bit when properly using the stabilizer.

References

1. "Practical Charts for Solving Problems on Hole Deviation," by H. B. Woods and Arthur Lubinski, paper presented at A.P.I. Mid-Continent District meeting, March 1954. The Oil and Gas Journal, May 31, June 7, 1954.

2. "The Need for Definition of a Crooked Hole," by R. B. McCloy, paper presented at A.P.I. Southwest District meeting, March 1952. The Oil and Gas Journal, March 31, 1952.

TABLE 2

Depth from	To	Ft. drilled	Bits used	Days	Feet per bit	Cost per ft. at $40 per hour rig time
1,091	2,838	1,747	40	24	42.15	19.50
2,838	3,696	858	13	8	65.5	12.20
3,696	4,715	1,019	23	17	44.3	20.15

What the Drilling Man Should Know About

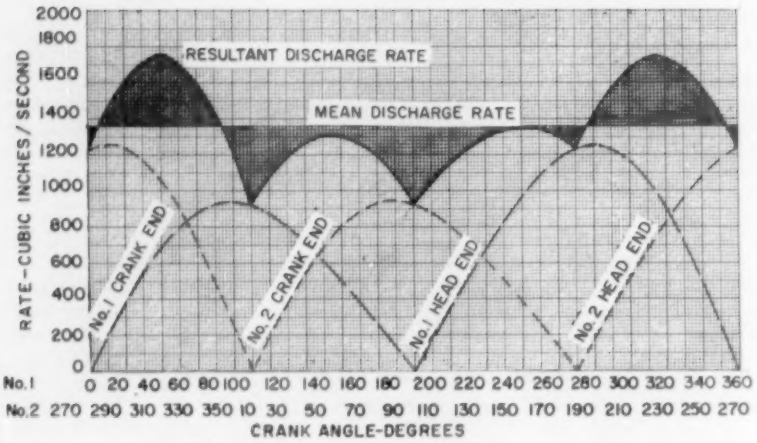
Operation Of Duplex Slush Pumps In Parallel

by R. L. Walker and R. A. Tappmeyer

In the proper phase parallel method, there are inherently smooth flow characteristics that, for comparable pressure and volume, cannot be duplicated with any single duplex mud pump of present design or by compound pump operation. This smoother flow permits an increase of allowable discharge pressure, and, thus, an increase in available delivered horsepower. Also, as a result of the reduction in pressure surges, it is natural to look for longer service from mud lines, drill pipe, holding brackets, swivels, wash pipe, drilling lines, etc.

The authors believe that economies due to reduced down time, higher horsepower application, and lower maintenance and repair costs, dictate application of medium-sized pumps in parallel to depths in keeping with their pressure capacity with smallest practical sized liners. For deep drilling, most attractive parallel application is offered by medium-volume-capacity pumps designed for high-pressure application, say 300 g.p.m. at rated speed with 5¼ or 5½-in. liners and a pressure rating of 2,700 psi. Two of these pumps properly applied in parallel will meet any foreseeable fluid power demands to 20,000 ft.

Authors are with Shell Oil Co. at Denver and Houston, respectively. Paper presented at Petroleum-Mechanical Conference of A.S.M.E., Los Angeles, September 29, 1954.



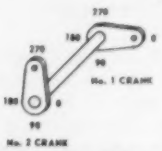


Fig. 1—This conventional duplex, double-acting pump has 5-in. liners and the cranks are 90° apart.

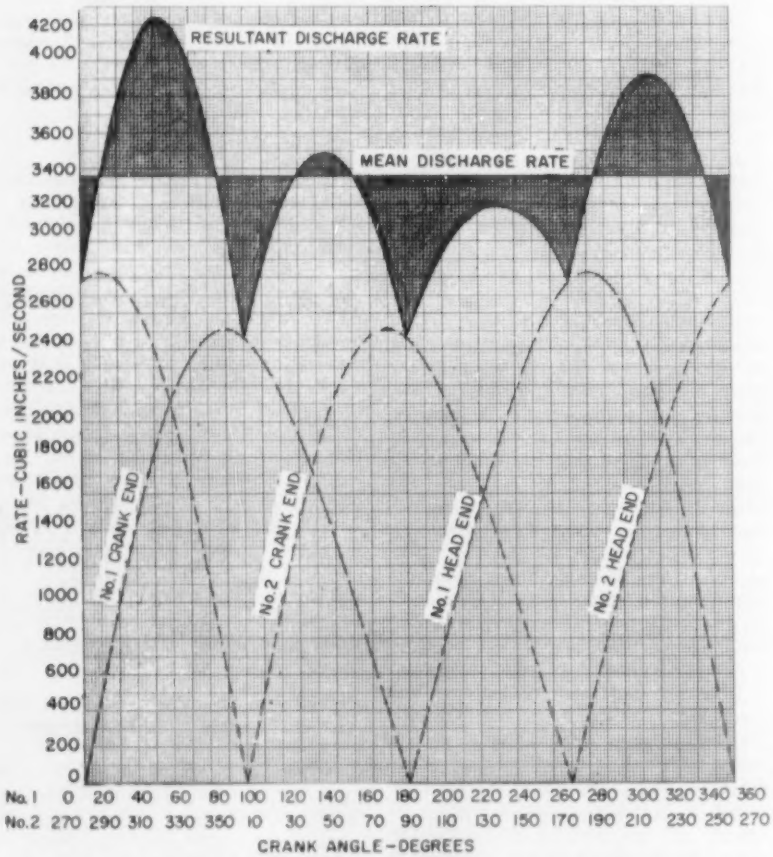
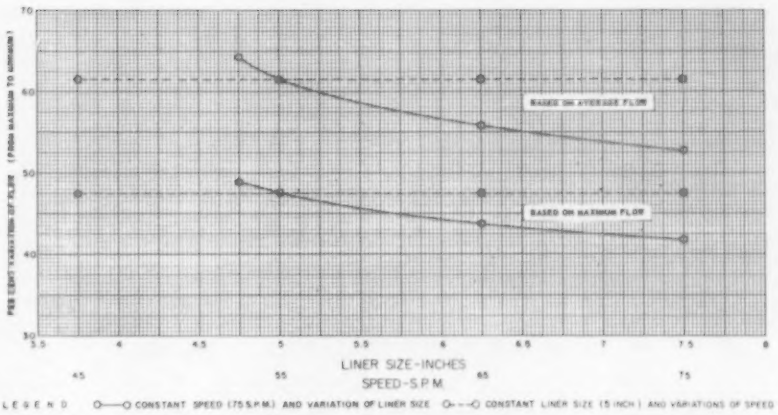


Fig. 2—These curves are for the same pump as in Fig. 1, but the liner size is now 7-in.


BASED ON AVERAGE FLOW
BASED ON MAXIMUM FLOW
LINER SIZE-INCHES
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LEGEND O—O CONSTANT SPEED (75 S.P.M.) AND VARIATION OF LINER SIZE O- -O CONSTANT LINER SIZE (5 INCH) AND VARIATIONS OF SPEED

Fig. 3—Differences in the fundamental flow of the same pump with different size liners.

THE drilling industry is realizing that increasing the hydraulic horsepower applied at the bit will give higher penetration rates and longer bit life. To get this increased horsepower, Shell Oil Co.'s Houston area is applying high-speed and high-pressure parallel operation of medium-size slush pumps at depths up to 10,000 ft.

The fundamental curve of instantaneous rate of flow for the conventional duplex, double-acting pump with 5-in. liners and the No. 1 and No. 2 cranks 90° apart is illustrated in Fig. 1. The resultant discharge flow at any given instant is the sum of the discharge rates of the two cylinders. The rate-of-flow curves for the individual plungers differ from the sine curve of simple harmonic motion in that the peaks for the crank and head end are of different heights. This is because of the reduced flow when the piston is moving toward the crank end with the piston rod occupying a portion of the active discharge cylinder.

Also, it will be noted that the crank-end curve leans toward the left (peak approximately 80°), whereas the head-end curve leans toward the right. This distortion is due to the moderate length connecting rod (ratio of connecting rod length to crank radius—$l/r = 5$). The individual plunger curves would be symmetrical and peak at 90° and 270° only for a rodless pump or one equipped with tail rods of the same diameter as the piston rods, and having an l/r ratio of infinity.

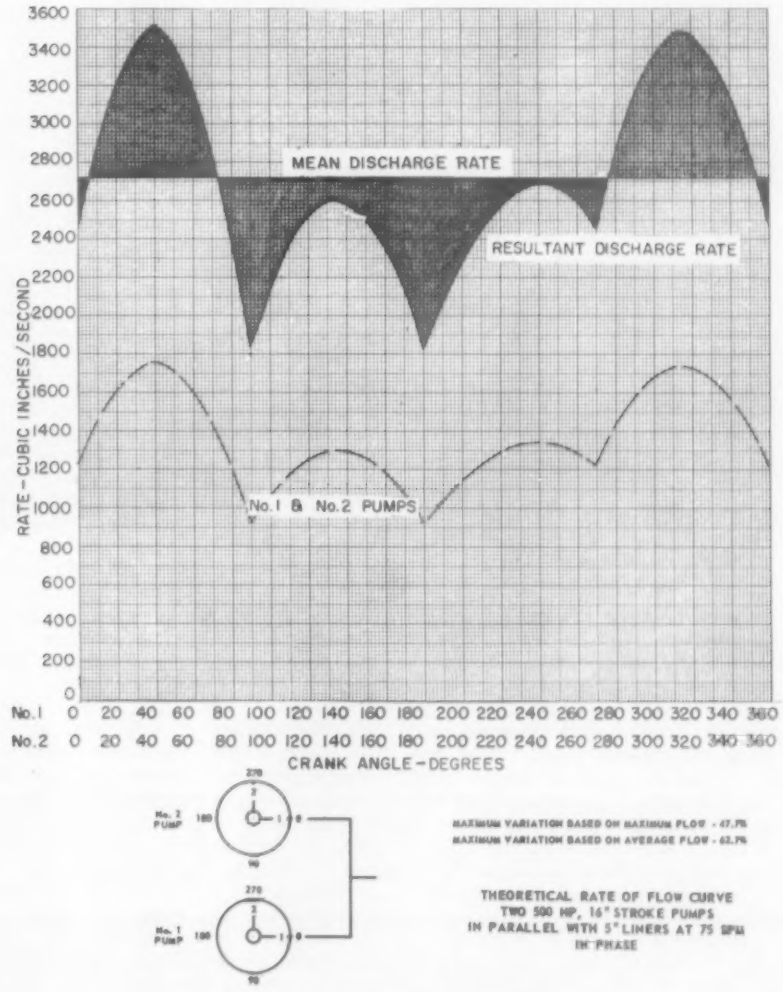
MEAN DISCHARGE RATE
RESULTANT DISCHARGE RATE
No.1 & No.2 PUMPS
RATE-CUBIC INCHES/SECOND
CRANK ANGLE-DEGREES
No.1 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
No.2 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
No. 2 PUMP
No. 1 PUMP
MAXIMUM VARIATION BASED ON MAXIMUM FLOW - 47.7%
MAXIMUM VARIATION BASED ON AVERAGE FLOW - 62.7%
THEORETICAL RATE OF FLOW CURVE
TWO 500 HP, 16" STROKE PUMPS
IN PARALLEL WITH 5" LINERS AT 75 SPM
IN PHASE

Fig. 4—Theoretical volume curves for two duplex pumps in phase.

Effect of liner size . . . The curve shown in Fig. 1 is for a specific 500-hp., 16-in.-stroke-length mud pump with 5-in. liners and 2½-in. rods. To show the effect of the ratio of the diameter of the liner to that of the rod, fundamental curves for the same pump at the identical speed with 7½-in. liners are plotted in Fig. 2. The differences in the relative heights of the peaks and in the sequence of their occurrence are apparent.

To illustrate further differences in the fundamental flow curves for the same pump with different sized liners, Fig. 3 is presented. By decreasing the liner size from 7½ to 4¾ in., the variation in flow, based on maximum flow, is increased from 41.7 to 48.9 per cent. This represents an increase in variation of flow of slightly over 17 per cent. It is this percentage which, in effect, expresses the degree of unbalance between the fluid pumped on the head-end and crank (rod) end strokes of each piston and which determines the minimum-sized liner for a given pump. For a given sized liner, Feg. 3 also shows that the per cent variation between maximum and minimum flow remains constant with changes in pump speed.

Characteristics of Duplex Double-Acting Pumps in Parallel

Volume variation . . . The phase relationship between two duplex pumps operating in parallel (the position of the cranks or plungers relative to each other) has a definite quantitative ef-

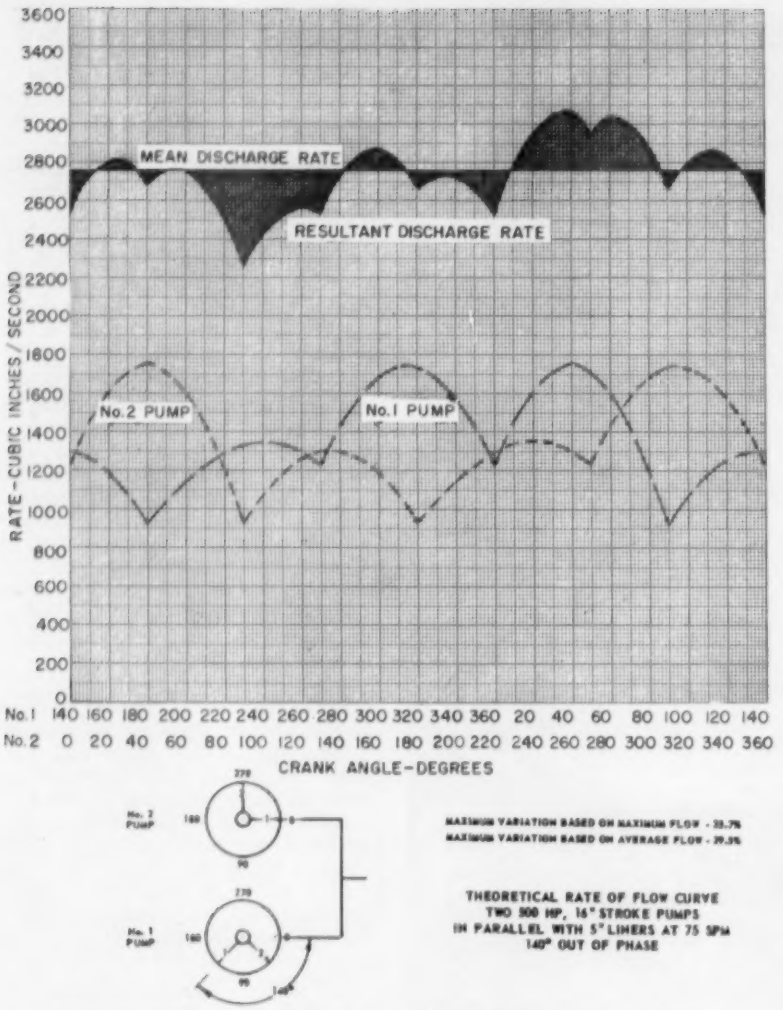
MEAN DISCHARGE RATE
RESULTANT DISCHARGE RATE
No.2 PUMP
No.1 PUMP
RATE-CUBIC INCHES/SECOND
CRANK ANGLE-DEGREES
No.1 140 160 180 200 220 240 260 280 300 320 340 360 20 40 60 80 100 120 140
No.2 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
MAXIMUM VARIATION BASED ON MAXIMUM FLOW - 33.7%
MAXIMUM VARIATION BASED ON AVERAGE FLOW - 39.3%
THEORETICAL RATE OF FLOW CURVE
TWO 500 HP, 16" STROKE PUMPS
IN PARALLEL WITH 5" LINERS AT 75 SPM
140° OUT OF PHASE

Fig. 5—Theoretical volume curves for two duplex pumps 140° out of phase.

fect on the degree of volume and pressure surges.

To illustrate the effect on the volume, templates were made of the fundamental curve, Fig. 1, and the curves were displaced varying degrees with respect to each other, and the resultant rate-of-flow curves were plotted. From these, the maximum percentage variation was determined. In this instance, with two pumps operating at the same speed with the same sized liners, either in phase or 90° out of phase, the variation in volume will be between 45 and 50 per cent. However, if the same pumps are operating between 130° and 180° out of phase, the variation in volume will be less than 30 per cent.

The resultant curves for conditions where the variation is greatest (0° out of phase) and the variation is least (140° out of phase) are illustrated as Figs. 4 and 5, respectively. It is seen, then, that by varying the phase relationship for these pumps the variation in volume may be reduced from a high of 47.7 per cent to a low of 25.7 per cent, an actual percentage reduction of 46 per cent.

Pressure variation . . . For a given system, with the mud flowing at turbulent rates, the pressure losses will vary as some power (between 1.5 and 2) of the rate of flow. It is safe, then, to assume that the characteristic pressure curve for a reciprocating pump will be similar to the characteristic volume curve and that pressure pulses will result both at the pump and throughout the system at the same frequency as, and in some ratio to, the volume variations.

To check this assumption, pressure recordings were taken from the common discharge line of two 500-hp. pumps operating in parallel at varying phase relationship. Both pumps were chain-driven from a common compound and, consequently, operated at identical speeds. Even after making allowance for the probable effect of such factors as the action of the air chamber, fluid slip, and possible lag in valve opening, a remarkable resemblance in shape was noted between the theoretical volume curves of Figs. 4 and 5, and the respective pressure recordings of the two pumps. By varying the phase relationship between the pumps by 140°, the variation in pressure was reduced from 31 to 13.5 per cent, a decrease of 56.5 per cent.

Effect of Pressure Variations on Fluid End

Because of the operating nature of a duplex double-acting pump, pressure variations imposed on the components downstream of the pump valve are not the same as those upstream. Any component of the pump or mud system downstream of the discharge valves is subjected to fatigue stresses which are a direct reflection in magnitude of, and in the same frequency as, the instantaneous pressures of the discharge pressure wave. Taking a cylindrical section out of the pump discharge valve pot above the discharge and calculating hoop stresses theoretically, the factor of safety for fatigue with the pumps 140° out of phase rather than in phase, should be increased by 0.3 or 14 per cent.

While these theoretical factors of safety may not seem to approach the calculated critical, it should be remembered that they were calculated on the basis of a simple cylinder. No allowances were made for stress concentration at stud holes, sharp corners, and at fillets and grooves. Good design would dictate allowance for such focal-point stress concentrations. Pump manufacturers will readily admit that much of this design is based on experience in the field. With the old method of operating pumps, in which rated pressures with the smaller liners were attained only for short emergency periods, fatigue failures were rare. However, now that pumps are being operated continuously at high pressures, at or near rated, in order to obtain optimum jet-bit performance, these failures are much more common.

Valve-pot failure . . . Suppose, now, that several fluid end fatigue failures were experienced in a valve-pot section within a short period while paralleling two of these 500-hp. pumps without regard to phase angle at 2,350 psi. Giving some thought to this type failure, it is realized that more realistic, and not theoretical, safety factors are needed. It can be shown that in order to stay within an allowable safety factor, as a general practice for parallel operations with no consideration given to the phase angle, the allowable operating pressure

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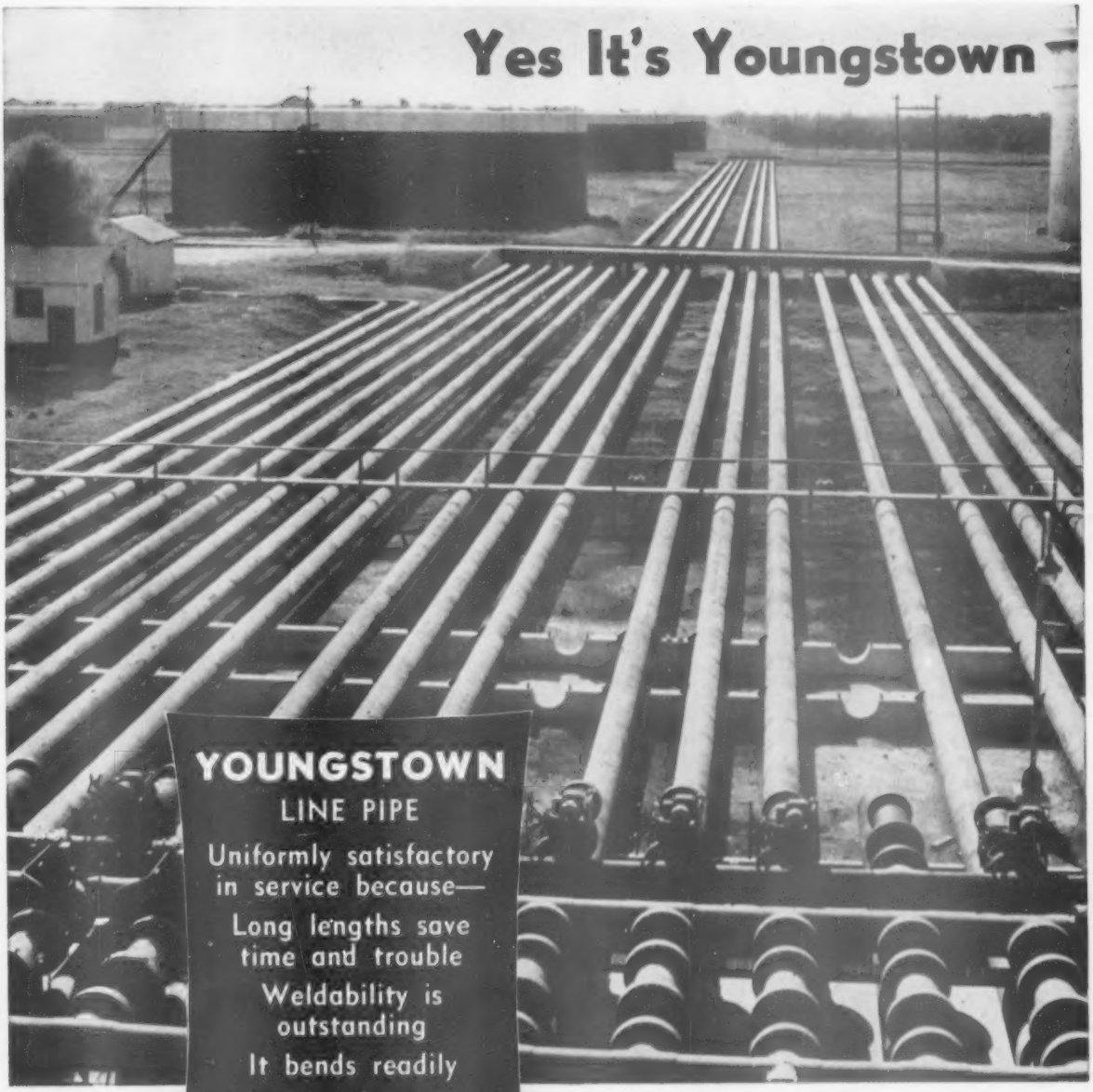

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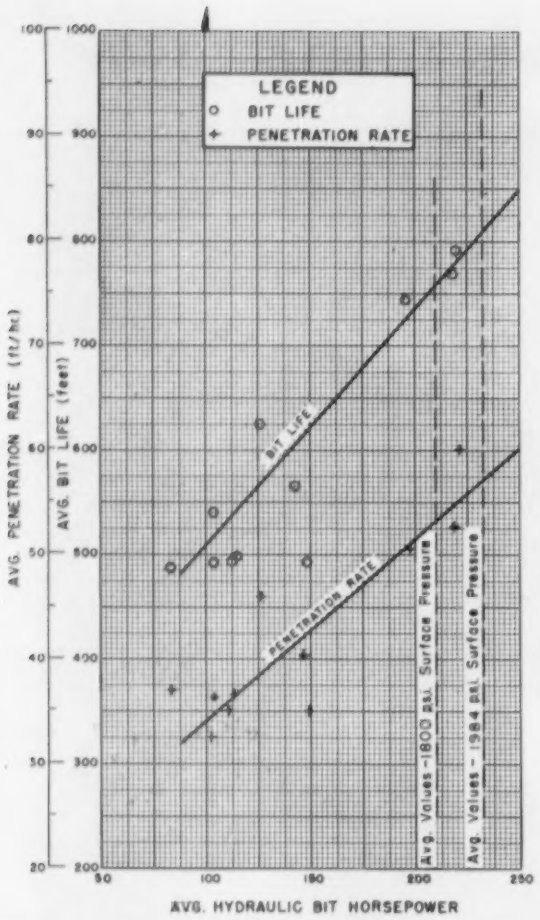


Fig. 6—This is a plot from actual experience in 8,000-ft. drilling in a Gulf Coast field.

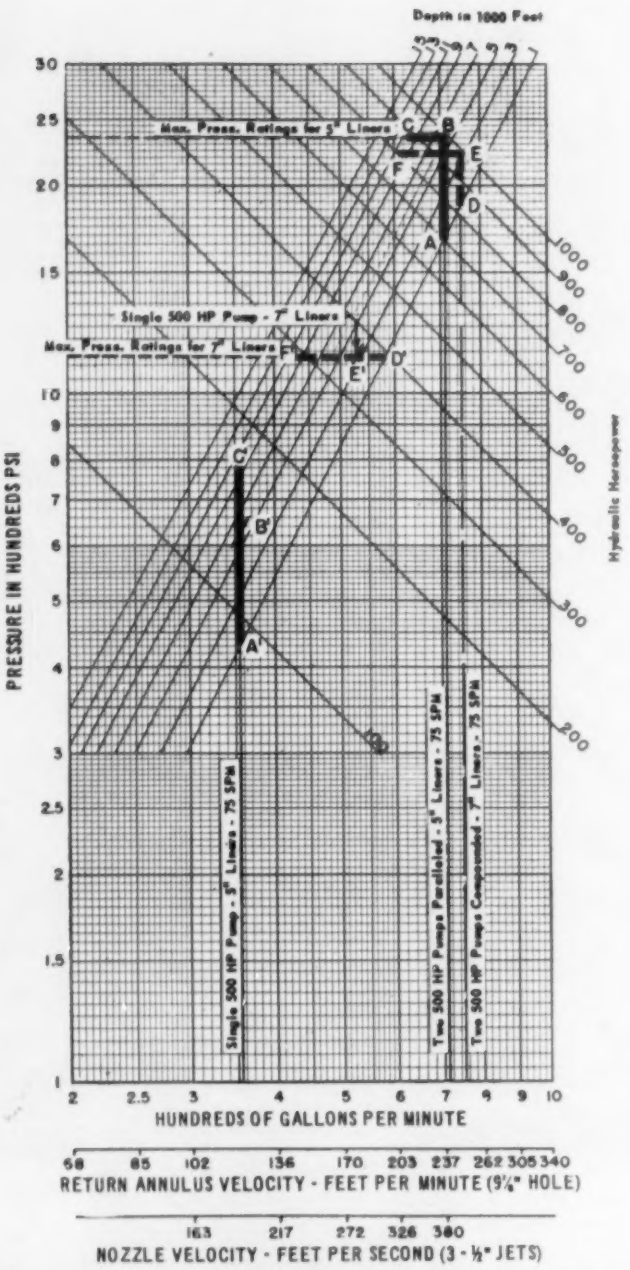

Depth in 1000 Feet
Max. Press. Ratings for 5" Liners
Single 500 HP Pump - 7" Liners
Max. Press. Ratings for 7" Liners
PRESSURE IN HUNDREDS PSI
Hydraulic Horsepower
Single 500 HP Pump - 5" Liners - 75 SPM
Two 500 HP Pumps Parallel - 5" Liners - 75 SPM
Two 500 HP Pumps Compounded - 7" Liners - 75 SPM
HUNDREDS OF GALLONS PER MINUTE
RETURN ANNULUS VELOCITY - FEET PER MINUTE (9⅞" HOLE)
NOZZLE VELOCITY - FEET PER SECOND (3 - ½" JETS)

Fig. 8—A comparison of compound and parallel operation of power slush pumps for a fixed hydraulic system.

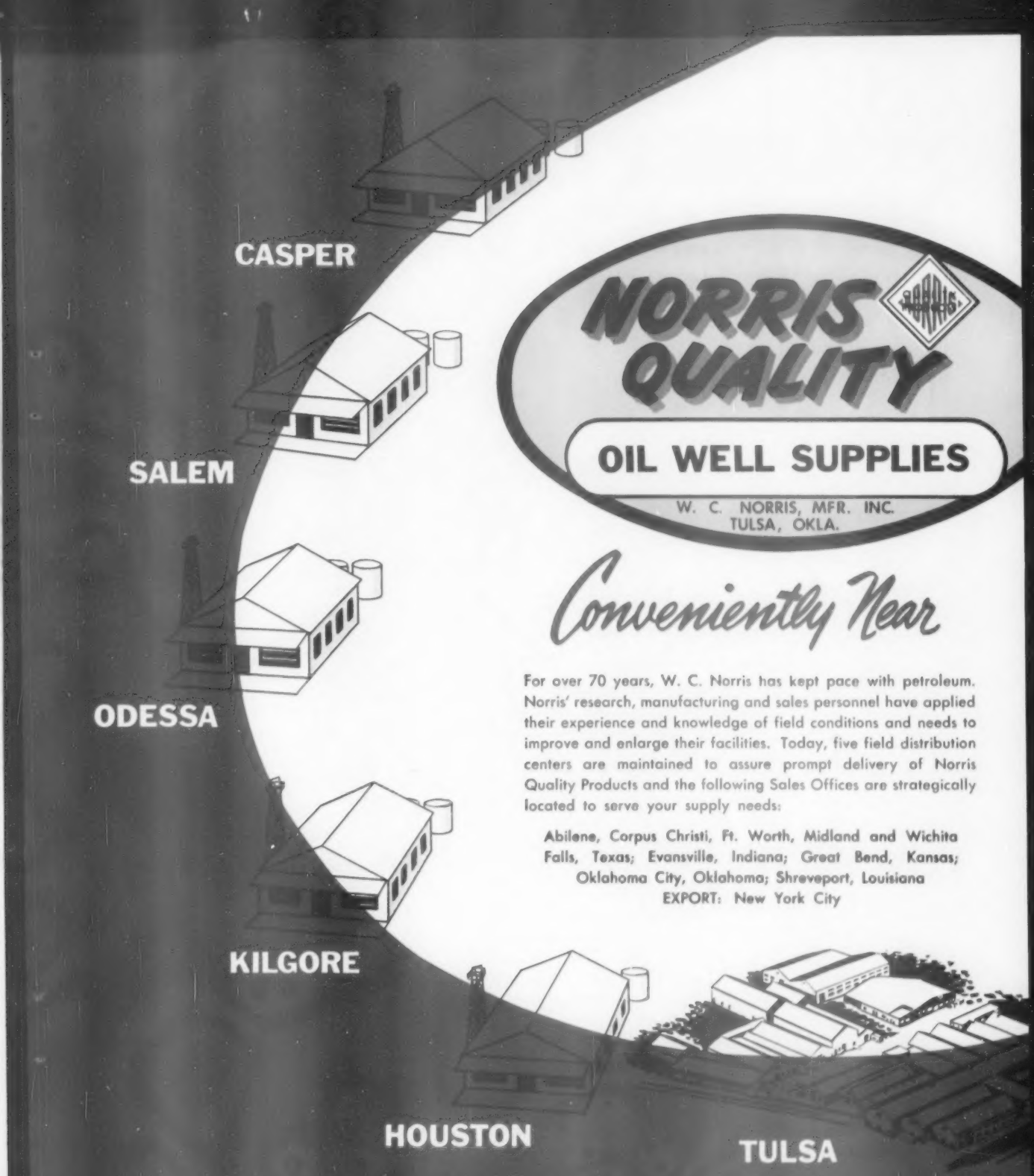
of these pumps should be lowered to approximately 1,800 psi. with 5-in. liners.

Can phasing help? . . . The question now logically presents itself: To what value could the maximum allowable average operating pressure be raised with the pumps 140° out of phase without exceeding the safety factor of these same pumps operating at approximately 1,800 psi. in phase? Valid fatigue calculations will show that the average operating pressure of the two pumps 140° out of phase may be raised to 2,075 psi. and still maintain the same safety factor. This is an increase in allowable pressure of 13.5 per cent.

Within pump cylinder . . . Unlike pump components downstream of the discharge valves, each end of each pump cylinder is subjected to stresses proportional to the discharge pressure waves for only approximately 180° of the pump stroke, that portion of the pump cycle during which the discharge valve at that end of the pump cylinder is open. For the remaining approximately 180° of rotation, pressure within the cylinder drops to atmospheric, or below, while the pump is taking suction.

An example of this type failure is the three fluid end cylinder fatigue failures experienced by Shell within 2 months while paralleling two 500-hp. pumps with 5-in. liner without regard to phase angle at approximately 2,350 psi. Each failure occurred after less than 1,000,000 stress reversals. Operating pressure was then actually lowered to 1,800 psi., and with no effort to phase operate, these same pumps were run continuously in parallel at a calculated safety factor of 1.3 with no further failures.

However, it was determined that, if the pumps are operated 140° out of phase, the maximum allowable average operating pressure can be raised from 1,800 to 1,984 psi., a percentage increase of 10 per cent, without exceeding the safety factor of 1.3. Since hydraulic horsepower of the system is proportional to allowable operating



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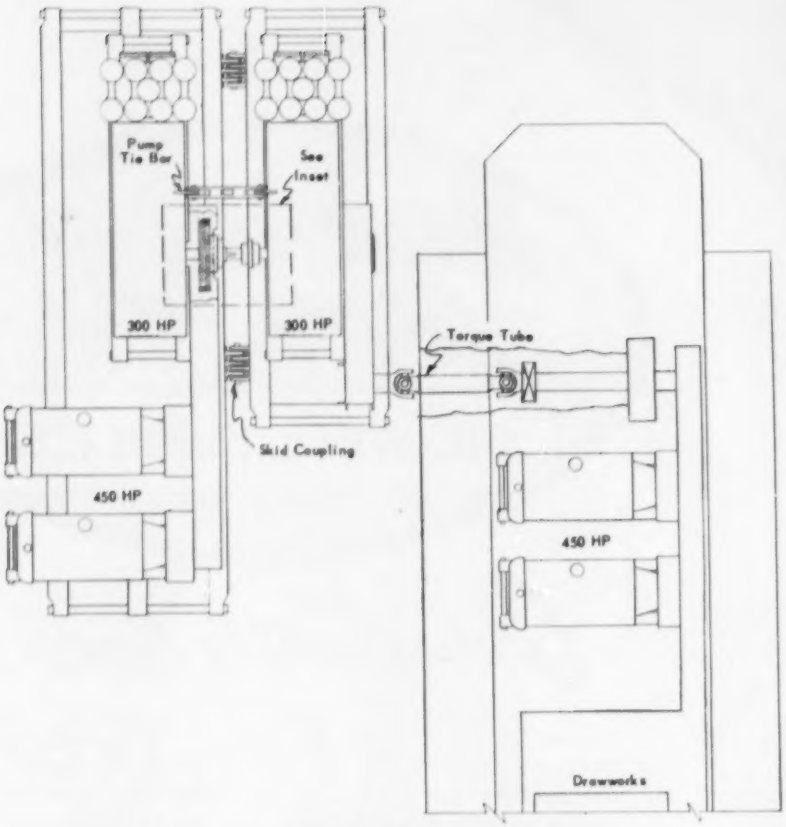

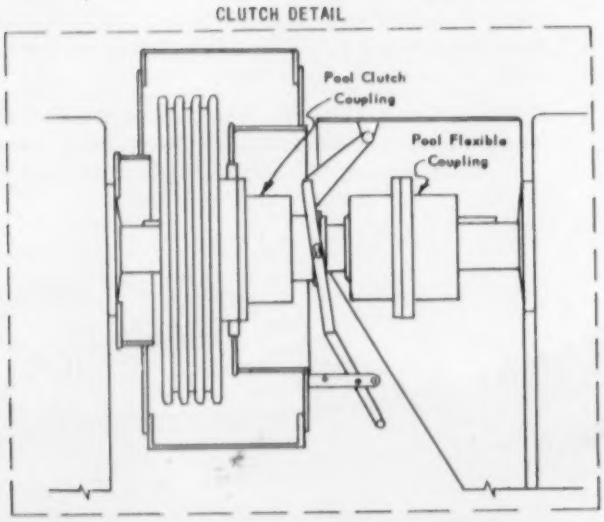

Fig. 7—A flexible power distribution exists with this arrangement of a recently purchased rig.

pressure, this same percentage increases in usable horsepower results.

Horsepower vs. bit life . . . Fig. 6 is a plot showing, from actual experience in 8,000-ft. drilling, the relationship of bit life and penetration rate to bit hydraulic horsepower in one Texas Gulf Coast field. If this average bit horsepower be increased by 10 per cent over that obtained from experience when operating at 1,800 psi., then average penetration rate may be expected to increase from 53 to 57 ft. per hour and bit life from 755 to 810 ft. Therefore, by proper phasing of these pumps in this field the per well savings in Table 1 may be anticipated.

How to place pumps . . . In view of the more desirable operating characteristics and the potential savings if two pumps,

TABLE 1—PER WELL SAVINGS BY PROPER PUMP PHASING
(8,000-ft. wells)

$1,200/Day Land Rig

	1,800-1,850 psi. max.	2,075 psi. max.	Savings	Savings ($)
Bits	11	10	1	$220
Trips (4 hours)	11	10	1	200
Rotating hours	151	140	11	550
Total				$1,170

$1,700/Day Marine Rig

Savings:	
1 Bit	220
1 Trip	280
11 Rotating hours	790
Total	$1,290

$7,500/Day Offshore Rig

Savings:	
1 Bit	220
1 Trip	1,250
11 Rotating hours	3,340
Total	$4,810

to be placed on the line in parallel, are operated at the right phase relationship, it is recommended that steps be taken to assure that this phasing can be obtained easily. To accomplish this objective, it is further recommended, as an initial approach, that the pinion shafts of both pumps be tied together by a positive clutch. The pumps, if possible, should be placed on common steel grillage and adjoined by rigid spacers to maintain proper level and clutch alignment. Universal joints at either end of the connecting link to provide for further misaligning should be provided. In this way, the pumps would always run together at 140° displacement and could be easily separated for repair and maintenance.

Further, more flexibility of power distribution is possible through such an arrangement. This may be illustrated with Fig. 7, the pump-power arrangement of a mobile dual trailer rig recently purchased by Shell, Houston area. Suppose, for instance, in sticky shale drilling, the rotary table demands 300 hp. This would leave available only 150 hp. from the rig power plant through the torque-tube drive to the inside pump. The remaining 150 hp. required to run this pump at full capacity will now be available from the independently mounted prime mover through the pinion shaft of the outside pump.

Parallel Operation Comparisons

IT would not be proper to leave this subject without making some comparison among the various ways in

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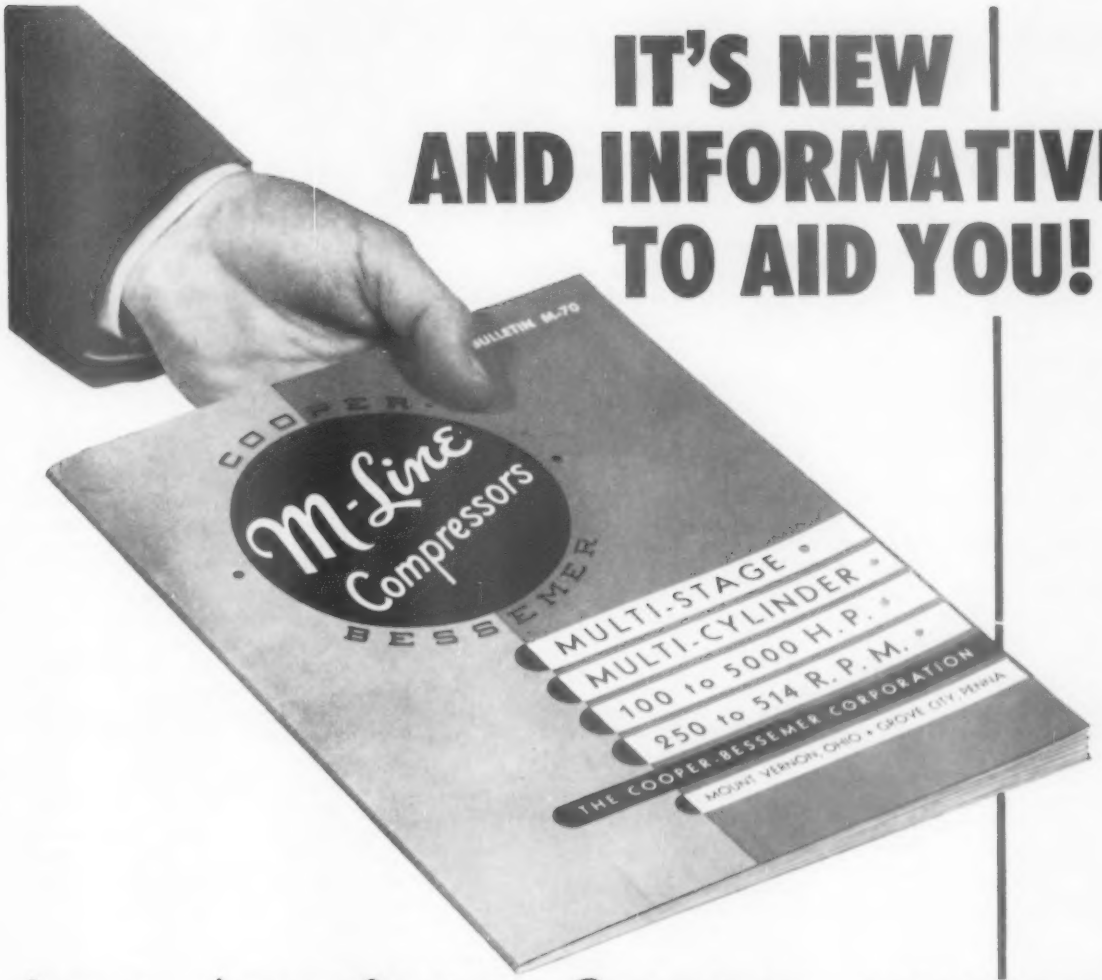

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which slush pumps are being operated to gain additional fluid power. Either parallel or compound operation gives greater hydraulic horsepower availability than single, normal or overspeed, medium-sized pump application.

The characteristics of these methods may best be illustrated by reference to Fig. 8. This graph shows the interrelationship between surface pressures, gallons per minute, depth, and surface hydraulic horsepower for a specific fixed hydraulic system. This approach of fixing the various dimensions of the system is used as an illustration and not as a recommendation. In actual practice it is most often necessary, in order to get rated capacity out of the pumps and to apply most efficient drilling practices, to change liners and/or nozzle sizes as the well goes deeper.

Changes . . . Trace ABC on the graph represents the manner in which hydraulic variables change in drilling from 1,000 to 10,000 ft. if the pumps with 5-in. liners are run in parallel and are ratioed at a maximum speed of 75 s.p.m.—15 per cent over rated speed. For instance, point B shows that if these pumps are run in parallel at the ratioed speed, at 6,000 ft., 710 g.p.m. at a pressure of 2,350 psi., or a hydraulic horsepower of 980, will be delivered to the system. Since this manufacturer, in the near future, intends to correct the weakness in this pump so that it will operate continuously at published pressure ratings, the "book" figure of 2,350 psi. for 5-in. liners was used. Point E illustrates that the same pumps, compounded, with 7-in. liners are at the same speed capable of delivering the same power to the system with resulting comparable return annulus and nozzle velocities.

With only one pump . . . Traces A′B′C′ and D′E′F′ feature these hydraulic variables when one pump is off the line with all physical components of the system, including liner size, remaining unchanged. For a hydraulic system of these dimensions, values from the graph are illustrated in Table 2.

TABLE 2—OPERATING VALUES FROM FIG. 8

Method—	Parallel	Single pump	Compound	Single pump
Point	B	B′	E	E′
Liner size, in.	5	5	7	7
Operating press., psi.	2,350	630	2,244	1,122
G.p.m.	710	355	750	535
S.p.m.	75	75	75	54
Hyd. hp.	975	130	980	350
Annular vel., ft. per minute	245	127	255	182
Nozzle vel., ft. per second	386	188	406	290

This highlights a characteristic which may well be considered "a rule of thumb" relative to dual pump operation; viz., if two pumps with fixed drive ratios and the correct sized liner are operating at capacity in parallel and one pump has to be taken off the line, the delivered horsepower is reduced by approximately seven-eighths; if in compound and one pump is removed, the delivered horsepower is reduced by approximately two-thirds.

Summarized, the important advantages and disadvantages of each of the dual methods of pump operation are as follows:

ADVANTAGES

Parallel

1. Divides horsepower load between two pumps. For deep drilling, small liner pressure rating is limiting pressure of system.
2. If pumps are properly phased, pump pressure waves will naturally damp each other and permit operation at higher average (uprated) pressures and consequently, greater horsepower outputs without exceeding permissible safety factors.
3. Pumps may be run at same speed from a common compound.
4. No special operating techniques required with regard to starting and stopping pumps.
5. No unusual dampening equipment or relief valves are necessary.
6. Very flexible power distribution is possible if pump pinion shafts are adjoined.

Series (Compound)

1. Divides horsepower load between two pumps. Twice medium sized liner pressure rating is limiting pressure of system.
2. Larger liners are used with series operation than with parallel operation. Therefore, if one pump is off line, volume and hydraulic horsepower penalty is not as great as with parallel pumps.
3. Low-pressure pump has only half the operating pressure of the system imposed on the fluid end, with, consequently, less fatigue failure possibilities on this one pump.
4. Pressure differential across pistons and closed valves of each pump is only one-half the line pressure.

DISADVANTAGES

Parallel

1. When one pump is off the line, severe penalty in volume (cut in half) and available hydraulic horsepower results if only two main pumps are employed on the rig.
2. Pressure differential across pistons and closed valves is equal to full line pressure.

Series

1. Additional investment of $5,000 to $10,000 for dampeners, relief valves, suction blinds, and vibration hoses required between pumps.
2. Special operating technique with regard to manner of starting and stopping pumps must be adhered to.
3. Pumps cannot be run at same speed because of differences in volumetric efficiency. Therefore, a separate prime mover is usually required for one pump.
4. Reliance must be placed in relief valves and dampeners which are still in the stage of development. If these yet unreliable appendages fail, extremely destructive pressure waves result.

Most important . . . All of these arguments for and against each of the dual pump operating methods are important. However, after considering all of these, it is felt that the particular significance of advantage No. 2 in favor of simple parallel operation, an advantage which cannot be duplicated with any other operating technique, dictates, for the present, a choice in favor of paralleling. The uprated power capacity as a result of this feature, with resultant longer bit life and faster penetration rates, should more than offset any greater usage of expendable pump parts as a result of higher differential pressures.

To minimize the effect of the disadvantages of the parallel method of pump operation which are mentioned, efforts to date have been concentrated along two lines: (1) improving the quality of pump parts so as to withstand the abuses of continuous high speed-high pressure surge operations, and (2) the adoption of time-saving equipment and practices directed toward decreasing down time when pump failures occur.

Overspeed and Overpressure Operation

Several operators, for emergency application or as a normal practice, have operated pumps at pressures in excess of the ratings for the installed liners. Too, in recent months, there has been a trend toward application of pumps considerably in excess of their rated speeds.

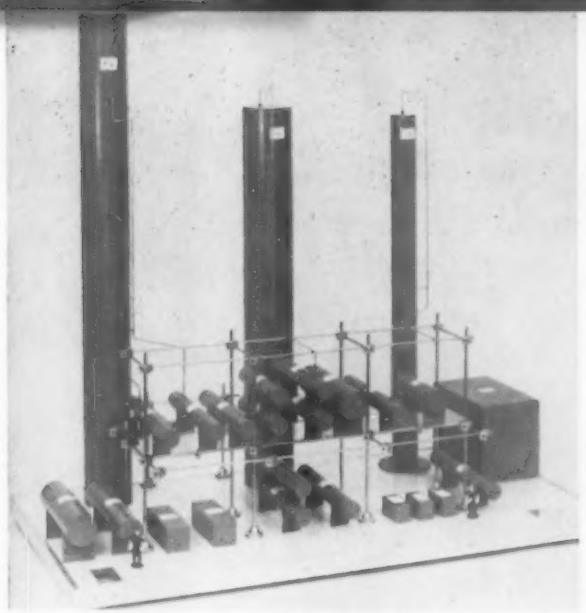
To illustrate the effects of these overloads, consider an 850-hp. 18-in.-stroke pump with 6½-in. liners, reciprocating at 76 s.p.m., 27 per cent over rated speed. At rated liner pressure of 2,240 psi. it will develop 915 hydraulic horsepower.

To produce this same maximum hydraulic horsepower at rated speed, the pump must be equipped with 7¼-in. liners and operated at 27 per cent over rated pressure. Since the end accomplished, in each case, is the same, which method, then, should be used?

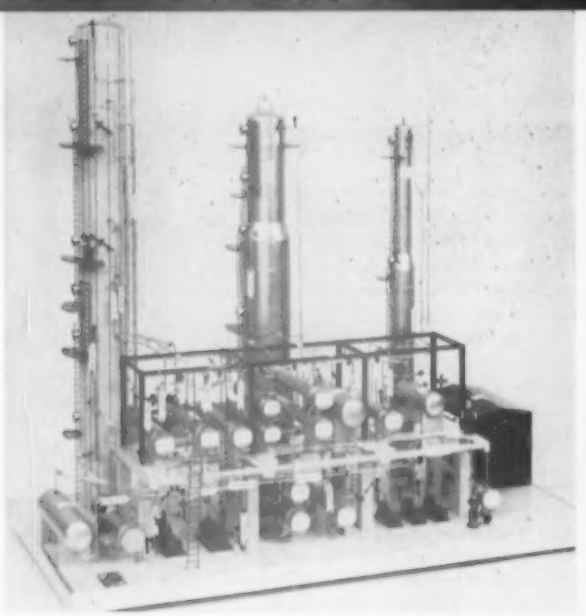
The fundamental law of rolling contact bearings is "the rated life of the bearing varies inversely as the cube of the load." Therefore, it can be shown in the pump under consideration that by the 27 per cent overload, bearing life is more than cut in half.

Now, looking at bearing speed, it has been found from long series of tests, that bearing life varies inversely as the speed. In the example, then, where pump speed is increased from 60 to 76 s.p.m., a 27 per cent overspeed of the pump, bearing life will be reduced by 21 per cent.

In the interest of portraying an understandable picture, the foregoing analyses, admittedly, were oversimplified in that cyclic pressure and speed variations were ignored; however, if these be considered, the conclusions relative to comparative life require little modification.



THIS STUDY MODEL of a fractionation unit is a mockup which is adjusted to conform to early layout plans. The type of "structure" supporting the exchanger section is made of rods and blocks which can be set for any desired floor elevation and vessel arrangement. As the layout plan becomes fixed, the major lines can be added to assure the most efficient arrangement. Fig. 1.



THIS DESIGN MODEL of the same unit as in Fig. 1 comes into use in the detailed layout of vessels, lines, etc. A cost-cutting device is the use of small-diameter brass rods to show center lines of all piping. Disks scaled to actual pipe sizes can be moved along the rods to determine clearance. This intermediate model identifies all vessels and lines and shows line size and flow direction. Fig. 2.

The Third Dimension in Engineering

by Stanley R. Harris

YOU may appreciate the difficulty of visualizing information contained on a blueprint. Day after day in all fields of engineering industry, thousands of people, each in his own way, transpose drawings of one or more views into the three dimensional picture represented.

Mechanical drawing is an old, well-established art, but one that leaves something to be desired in building today's complicated plants—plants like refineries where the forest of steel, the banks of equipment, and the maze of piping require many months of design time and piles of paper work.

The crux of a designer's and client's working together is a common understanding. With a three-dimensional aid, the scale model, little is left to imagination. Intelligent discussions covering a great deal of ground in short time are held frequently around the model. The engineers learn the wants of the client and the client sees the proposal of the engineers. Some points are revealed that might never arise until erection of the plant. All these proceedings lead to quicker, sound decisions from the client to help the progress of the project.

Coordination between the many design groups required to build a modern plant is greatly improved with a model. The help in visualization is enough in transmitting ideas. But with plans and sketches being routed to the modelmaker, who is equipped to make additions and changes and who keeps the model current, a designer finds out if the ideas are working or pose new problems. Designers spot changes of which they may not have been informed. The answers to many questions which are delayed while someone higher up tries to get time enough to look at prints are resolved in short order.

One of the most important points arising from the model program is the control it affords an engineering firm over its drafting force. For a large project, more men must be taken on to a peak, and then let go near the completion of work. The use of models can help to level off the fluctuation in personnel by increasing the capacity of the permanent staff—more projects can be bid on and accepted with their increased output.

Author is with Project Models, Inc., 53 Rose Street, New York.

Three-Phase Program

The over-all task of plant design has been classified into three phases: study, design, and check.

Study phase . . . Here the basic planning is done to start the project. The study model (Fig. 1) consists of one or more bases, depending on the size of the plot, of proportions convenient for working and handling. Each base is covered with a grid to enable those using the model to quickly locate the various components without having to take measurements with a scale rule. Battery limits are laid out and equipment (fairly accurate mockups made from rough sketches) is set in position (as on a plot plan) in accordance with early layout ideas. Structures are erected in such a manner that changes in column spacing or floor elevations can be made very quickly. These structures are flexible as is the entire model at this stage.

A modelmaker who is an experienced engineer or draftsman works with and under the supervision of the design groups. He erects the structure and locates equipment. As the layout firms up, he "ties down" the structures and equipment pieces and procedes to install some of the major process lines to assure good arrangement of equipment.

Design phase . . . This phase is reached when the plot plan, equipment arrangement, and structures are firm or nearly so. The design model (Fig. 2) consists of one or more bases, again depending on the size of the plots, to facilitate

working and handling. All concrete above grade; all primary and secondary structural steel including fireproofed members; all equipment (vessels, pumps, exchangers, compressors, and so on) and their supports. Components are scale replicas of the actual units. Equipment pieces, column, and reference lines are all marked for quick identification. When delivered, the model lacks only piping.

As with the study model, a modelmaker works with and under the supervision of the purchaser's design groups. The plot is divided into areas and a team consisting of one or two designers and one modelmaker work each area. The largest (or most expensive) piping is considered and installed first—this assures them the most advantageous and economical location and also sets the pattern for the piping that follows. Piping studies are made on the model. The designer will see how best to route his lines and locate nozzles and valves. If the first idea is not the best, it can be changed quickly. Minor changes or additions to structures can also be made as design progresses.

Piping is represented on the model by small-diameter brass rod indicating center line of pipe. Disks on each rod show the outside diameter of the pipe. These disks can be slipped along the line to show clearances, and are colored according to an established color code. All lines are tagged to show line numbers and direction of flow. Valves are indicated and color coded.

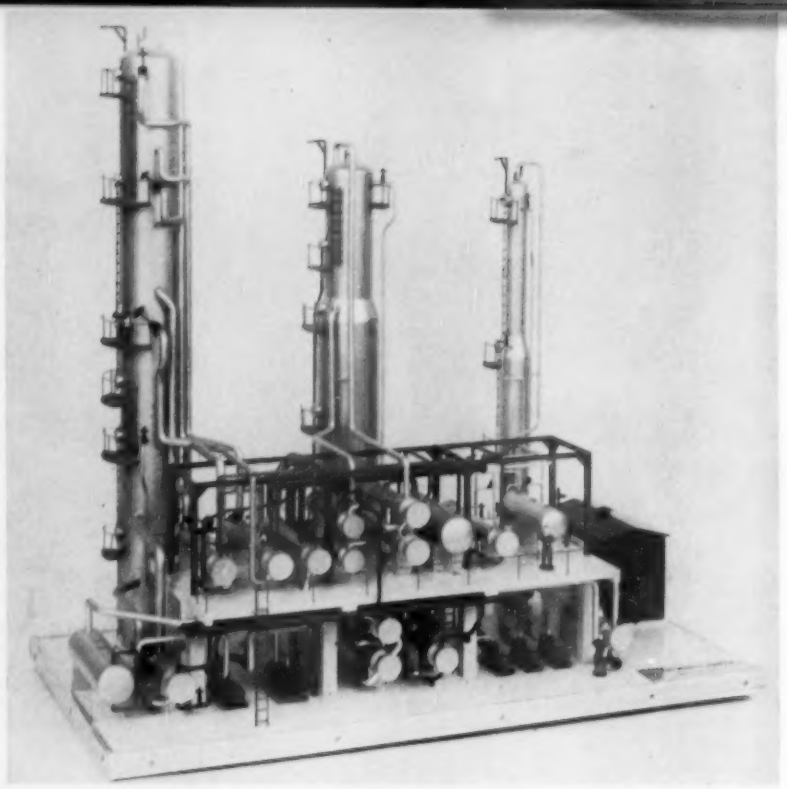
Finished drawings can be started very early with the designers feeding information to the draftsmen who in turn can refer to the model to clarify that information. Final drawings can be deferred until design is approved on the model.

The design model will:

1. Minimize design time. Fewer men will achieve the desired design with far less studies, and in far less man-hours.

2. Shorten drafting time. Draftsmen can complete final drawings in far less man-hours with no question on how or where to tie in with adjacent areas. Checking is reduced to a matter of addition and subtraction of dimensions. Most of it is done on the model, including process check. A minimum number of revisions and issues of drawings is necessary.

3. Improve design. Shorter runs of pipe with fewer fittings are possible. Better consideration is given to maintenance. Platforms and ladders are located where they will do the most good. Accessibility to all instruments and valves is assured.



THE CHECK MODEL of the same unit gives an accurate check on design. It is built from final drawings and finds many uses during construction and operator training, and facilitates safety and time studies, future planning and cost estimating. This final model can be simple or fancy, depending on the use to be made of it. Fig. 3.

4. Coordinate engineering groups. The model keeps all groups abreast and expedites the job by promoting the exchange of information and ideas, and the contributions of lessons learned by past experience. Instrument and electrical groups can quickly agree with the piping group on reserved space; structural will agree with mechanical about support of equipment, and with piping on support of pipe. Process men will keep a constant check on flow of material and prevent omissions and process errors. Erection men will plan their work early and be sure that their problems are considered.

5. Cut bids from subcontractors. Painting, rigging, and insulation contractors need not add large contingencies for unknown to their bids.

Check phase . . . Actually a check of finished drawings of the plant. The check model (Fig. 3), which is an accurate mechanical check of design is made in the modelmaker's shop from final drawing and is normally finished simultaneously with the completion of the drawings. The extent of the detail to be included on the model is agreed upon according to the use contemplated for the model after the plant is completed. If, for example, the model will be used as a permanent display in the client's offices or as a training aid in a university, it will usually contain more detail than if it is to remain in the operating office at the plant site.

The check model has 10 functions—foremost are design, check, erection and training; however, its use for time study and safety standards, future planning, cost estimating, advertising, public relations, and labor relations should not be underestimated.

The scale to which the models are built is determined by the size and complexity of the unit. They must be planned to pass through normal size doorways. Study and design models are usually made ⅜-in. to the foot, and check models ¼-in. to the foot. A tolerance of 1 scale inch is maintained.

Photographs can be used to transmit information to people who cannot conveniently visit the model—and can also serve as a record of "before and after" changes and progress reports.

How much the model user will **save** depends upon how much he will **use** it. Its possible to save as much as 30 to 40 per cent on the design and drafting budget alone plus another 5 to 10 per cent on erection and piping installation. Additional savings can be made on pipe and fittings, and the intangibles like elimination of interferences, or in the output of a plant that goes on stream before scheduled startup. Model costs run approximately 0.15 to 0.2 per cent of actual plant cost. A model program can save the user from 10 to 20 times the model cost—and result in a better designed and more efficient plant.

Here's what Shell tests revealed about

In-Tank Mixing of Crude Oil

From both pipeline and refinery standpoint, the advantages are numerous

by Neil G. Wilson

THE use of in-tank mixers appears to be an economical solution to two problems of long standing in pipeline and refinery operations—accumulation of sediment in crude-oil storage tanks and gravity variations in crude streams to refinery units.

A series of tests made by Shell Pipe Line Corp. has established, both from a pipeline and a refinery standpoint, the economies of installing mixers and an operating procedure for best results. The tests were conclusive in proving the best procedure to be that of mixing while the tank is filling. Other methods, mixing while emptying or mixing a full tank, were either too slow or did not achieve complete blending.

From a pipeline viewpoint, tank-cleaning costs which could be eliminated by keeping the b.s. and w. in suspension were compared to mixer installation, operation, and maintenance. Also considered were the possibility of increased vapor loss from agitation, effect on pumps of the additional suspended solids, and the extra power necessary to pump the b.s. and w.

For the refineries an important factor was the effect of additional solids accumulating in refinery tanks if mixers were not installed there. The possibility of increased tube fouling had to be considered also. The promise of more efficient desalting and distilling by having a more uniform stock was an offsetting advantage.

Pipeline considerations . . . Records of tank-bottom buildup in four major tank farms indicated that accumulation was at an average rate of 700 bbl. per tank per year in normal handling of Texas and Oklahoma crudes. In tanks that were worked infrequently the deposition rate was higher by a factor of 1.5 to 2.

Removal of sediment at these farms was necessary every 4 or 5 years with the cost ranging from $5,000 to $8,000 per cleaning for an 80,000-bbl. tank, including at least $2,000 for marketable oil and wax lost in the bottoms. In some cases the hydrocarbons lost were valued as high as $6,000.

The loss of refinable oil and wax is usually greater in larger tanks. One company has four 122,000-bbl. tanks that have been in West Texas crude service for 5 years. They will soon be taken out of service for removal of 29,000 bbl. of sediment containing about 40 per cent hydrocarbons. The cost of cleaning will be at least $43,000, including labor, overhead, and value of bottoms. After cleaning, these tanks will be equipped with mixers.

The cost of equipping 80,000 and 122,000-bbl. tanks with mixers is about $4,000 and $8,000 respectively, allowing one 25-hp. mixer for the smaller size and two for the larger. Annual operation and maintenance cost was estimated to be $250 per mixer.

Thus, on the basis of cleaning costs alone, a mixer for an 80,000-bbl. tank will pay out (before taxes) in 4 to 5 years. Intangible factors such as those listed below make the investment much more attractive.

1. The value of lost storage while a tank is cleaned.
2. Decline in tank volumetric efficiency as the b.s. and w. level raises.
3. Corrosion of bottoms by connate water.
4. Disruption of routine dispatching procedures during tank cleaning.
5. Difficult or inaccurate hand gaging because of bottom sediment.

Elimination of any of these factors meant an appreciable saving but the amount could not be rigidly determined.

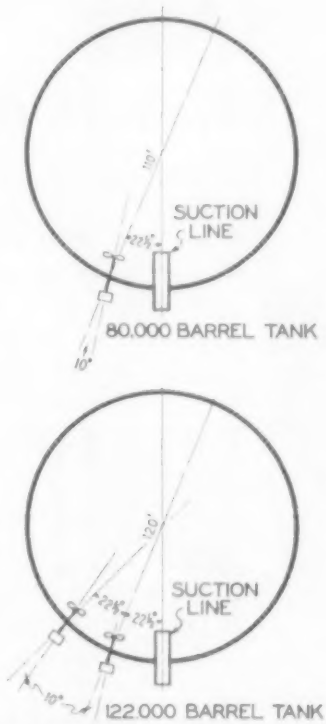


Fig. 1—Placement of tank mixers. The mixer shaft is inserted horizontally about 36 in. above the tank floor. All installations have a 26-in.-diameter propeller of cast iron or stainless steel which projects into the tank about 32 in.

Buildup pattern . . . Data on tank bottoms showed that sediment built up around the tank periphery to heights of 4 or 5 ft. in about 4 years, and then accumulated at a much slower rate. The lower rate of accumulation results from use of stationary filling-suction lines that enter just above the tank floor and generate a sweeping action at the tank center.

After the accumulation reached 5 ft., sediment was transported to the refinery at approximately the same rate at which it was received at pipeline terminals. Also, at this stage of buildup, large volumes of the sediment will occasionally break loose and move into the pipeline system.

The factors of increased wear on pumps and pump seals and increased power consumption for transporting the b.s. and w. proved to be of little consequence, as did the item of increased vapor loss from the agitation.

Effect on refinery . . . No exact cost was assignable to distilling-throughput losses as a result of crude-oil-gravity fluctuations; however, reductions of as

Author is with Shell Pipe Line Corp., Houston. Condensation of paper presented at the petroleum mechanical engineering conference of the A.S.M.E., Los Angeles, September 27-29, 1954.

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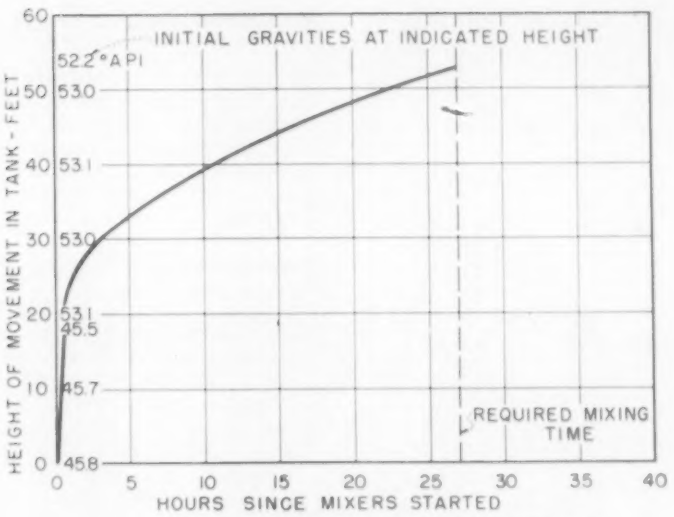

Fig. 2—Ascent of circulation in 122,000-bbl. tank.

much as 3,700 bbl. in 8 hours had been experienced and smaller losses were fairly common. Slugs of b.s. and w., on reaching the refinery, had caused desalter loads considerably above normal and, in some cases, long settling times were required for the contaminated crude.

From analyses of tank bottoms it was calculated that about 1,236,000 lb. of foreign solids was delivered into one refinery each year. The solids, which amounted to only 1 to 2 per cent of the total bottoms, consisted of about 10 per cent fine quartz sand, 50 per cent ferric oxide, and 40 per cent gypsum, calcite, and other formation materials. Of the solids delivered to the refinery, 4 per cent settled in refinery tankage and the remainder was presumably removed by the desalting process.

The installation of mixers in pipeline tanks was expected to increase the amount of b.s. and w. to refineries by about 0.04 per cent. This was verified by comparison of two tank farms, neither of which used mixers, which received the same kind of crude. One received crude from mixed storage and the other received from unmixed storage. There was no discernible difference in bottom accumulation rates.

As to the question of tube fouling, a consultation with a company using mixers on all crude tanks revealed that no unusual difficulties had been encountered on this point.

Installation and tests . . . Mixers are currently installed as shown in Fig. 1. The mixer shaft is inserted horizontally about 36 in. above the tank floor. All installations have a 26-in.-diameter propeller of cast iron or stainless steel which projects into the tank about 32 in.

Motors are 25-hp., 1,740-r.p.m. with grear reduction for a propeller speed of 420 r.p.m. Some installations are equipped with shaft packing and some with mechanical seals. Experience is inadequate to express a preference for either the packing or mechanical seal.

Tests were devised to determine the most satisfactory operating procedure for achieving uniform blends prior to starting deliveries from storage tanks. These tests were intended to solve an operational problem and no attempt was made to investigate basic mixing theory.

Six 80,000 bbl. and six 122,000-bbl. tanks were used in the tests and results were obtained on four grades of crude. Blended batch gravities at test temperatures ranged from 32° to 50° A.P.I. and in-tank gravity differences from 1.0° to 15.4° A.P.I. Viscosities of the blended batches varied from 34 to 80 S.U.s. Properties of the components before blending varied from 22° to 53° A.P.I. and from 30 to 350 S.U.s.

Tests were made on tanks being filled, tanks being emptied, and on full tanks. In conformance with refinery process requirements, a satisfactory blend was considered one in which the oil delivered from a tank varied in gravity not more than 1° A.P.I. To obtain data points some tests were made on tanks containing oil with an initial variance of less than 1° A.P.I.

Initial tests were conducted by agitating while the tank was being emptied. Gravity samples were obtained at 6-ft. intervals prior to starting the mixers. The mixers were started when the tank was opened to suction and operated until the tank was low-gaged.

In-tank gravity differences compared to line samples taken at 15-minute intervals quickly proved this method of blending to be unsatisfactory. Where an appreciable gravity difference existed in the tank, the pipeline batch showed a similar gradient.

Full-tank blending . . . In these tests mixing was started and continued until there was agitation at the top of the oil. Gravity and b.s. and w. samples were then taken at the top, middle, and bottom and were compared with those taken before mixing started.

Other samples taken during mixing showed that at any time during the test, mixing was complete in the moving portion of oil from 1 ft. below the static oil to the tank floor. The maximum variation in gravity found in the circulating portion of oil was less than 1° A.P.I.

The rate of ascent of circulation was determined by lowering a weight on a gage line to the point where movement could be detected. By successive measurements, the time required to achieve full circulation could be predicted by plotting the rate of ascent. Apparently a gravity change causes deflection of the upward velocity vector toward a horizontal plane, decreasing the mixing rate, as shown in Fig. 2.

After shutting off the mixer, measurement was continued to determine how long the oil would circulate. Low-viscosity, high-gravity oils continued in motion for several hours afterwards, but high-viscosity, low-gravity oils came to rest in 2 or 3 hours.

The movement did not affect oil level gaging after mixers had been off for 2 hours provided gaging was done in a well extending to the tank bottom. However, movement did have an appreciable effect on measurements taken through roof hatches.

Gravity correlation . . . Results of tests on full tanks are shown in Fig. 3 and in Tables 1 and 2. The best correlation was the blending time as a function of initial gravity difference. These data plotted esesntially a straight line on log paper and lines were fitted to such a plot by the method of least squares. Values were then taken from the lines to derive the curves of Fig. 3. The correlation shown is considered ideal because A.P.I. gravity can be determined readily in the field.

Since stratification results in deflection of the upward velocity vector, the position of the interface affects mixing rate, i.e., a lower interface means a longer mixing time. Gravity difference, however, has far more effect on mixing time than the interface location.

Elimination of large gravity differences in full tanks was found to require such a long time as to be impractical. An 80,000-bbl. tank was purposely

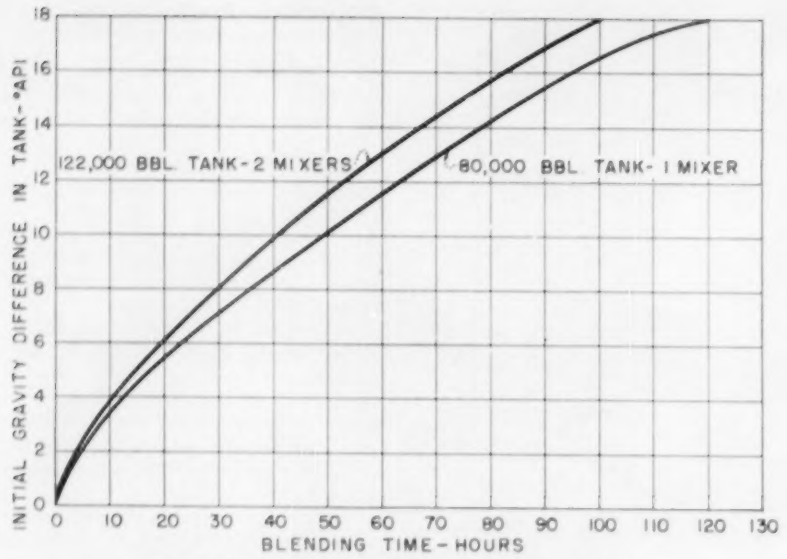

Fig. 3—Required blending time for full tanks of crude oil.

TABLE 1—SUMMARY OF RESULTS FROM TESTS ON FULL 80,000-BBL. TANKS

Test No.	Average viscosity S.s.U.	Average viscosity °A.P.I.	Initial gravity difference °A.P.I.	Final gravity difference °A.P.I.	Required mixing time
7	58.0	32.0	0.2	0	11 minutes
19	49.0	38.3	0.3	0	17 minutes
10	43.0	39.2	0.3	0	30 minutes
22	50.0	37.0	0.1	0	50 minutes
12	47.0	36.2	0.5	0.1	1.1 hours
18	46.0	36.7	2.1	0.1	3.5 hours
6	39.5	42.0	2.9	0.1	9.0 hours
21	73.0	32.0	15.4	0.2	92.0 hours

TABLE 2—RESULTS OF TESTS ON FULL 122,000-BBL. TANKS

Test No.	Average viscosity S.s.U.	Average viscosity °A.P.I.	Initial gravity difference °A.P.I.	Final gravity difference °A.P.I.	Required mixing time
11	38.0	42.8	0.3	0	13 minutes
17	50.0	34.9	0.3	0	30 minutes
14	32.0	47.1	0.7	0.1	48 minutes
15	35.5	46.2	1.3	0.5	1.7 hours
8	36.0	37.2	1.1	0	1.8 hours
16	35.4	44.9	4.0	1.2	10.5 hours
9	34.0	50.3	7.6	0.8	27.0 hours
20	37.0	44.4	7.8	0.4	29.0 hours

filled so as to give about 15° A.P.I. gravity difference. Complete blending required more than 90 hours.

Mixing during filling . . . Crudes with large gravity differences were also used to compare effectiveness of full-tank mixing with that of mixing while filling. In this test the tank was half-filled with light oil and mixing was started as the heavier oil was pumped in. Filling and mixing continued for 25 hours and at the end of that time the tank was uniformly blended. These tests show conclusively that mixer operation while filling the tank is the most successful blending procedure.

Blending crude oils while the tank is filling places a maximum limit on the allowable mixing time. If a tank is to be blended by the time it has been filled, mixing time cannot exceed filling time. It is believed that mixers provided as herein described can accomplish this objective. As long as required mixing time is not greater than filling time, expenditures for additional mixing capacity cannot be justified.

Further tests on mixing while filling indicated that when the gravity of the incoming stream is equal to or higher than that of the oil in the tank, agitation is unnecessary in most cases. However, to avoid errors, mixers should be operated each time a tank is filled. Since the propeller discharge reaches upward about 20 ft., the mixing operation need not be started until that gage is reached.

Bottoms accumulation . . . Bottom thievings taken before and after each test failed to show a reduction in deposits. However, suspended b.s. and w., as shown by the oil samples, increased about 0.1 per cent after agitation and was uniformly distributed — definitely indicating a pickup. The tests were performed in tanks which had bottom accumulation ranging from a very small amount to 5 in. The tanks had been in service several months and the mixers about 1 month.

Suggested Operating Procedure

As a result of the tests the following operational procedure is suggested:

1. Where possible, mixers should be operated while filling the tank, since this consumes no storage time and is the most effective. At each filling, mixing should be started when the tank reaches a gage of 20 ft. and continued until the tank is full. After filling, a check should be made for oil circulation at the top of the oil and mixing continued until this movement is present.

2. If it is not possible to mix while filling, the top, middle, and bottom gravities should be determined, the difference noted, and the required mixing time found from a working curve similar to that of Fig. 3. Mixers should be operated the indicated length of time or until movement is noted at the top of the tank.

3. A full tank should be agitated for an hour while on suction to resuspend settled bottoms.

These methods have been in use by one company for 8 months and appear adequate for blending. They have not been in effect a sufficient length of time to determine adequacy in preventing sediment accumulation, but it appears that this problem, too, has become one of the past.

Acknowledgments

For the section on economics, indebtedness to P. J. Leininger and W. P. Bryan, Shell Oil Co. is acknowledged. They and the author worked as a committee on the investigation. The operating tests were conducted jointly by A. B. Parkhurst and the author, with valuable assistance from R. J. Evans and numerous operating personnel of Shell Pipe Line Corp.

COATING WITH ASPHALT and wrapping with glass fiber and coal-tar-impregnated, perforated asbestos felt wrapper at R. H. Fulton & Co. spread laying 12-in. near Glenwood, Minn.

Great Lakes Testing Coatings

Data gathered will aid in evaluating materials, methods

by Paul Reed
Pipeline Editor

IN this year's expansion program Great Lakes Pipe Co. is laying 715 miles on projects in Nebraska, Missouri, Iowa, Illinois, Minnesota, and North Dakota. Significant features of these projects are the practices for coating the pipe.

The relative values of several types of pipe protection will be determined by tests and studies to be carried out by Great Lakes Pipe Line Co. Coal-tar enamels and asphalt are being used on different projects. These coating materials are applied by railhead coating, yard coating, and over-the-ditch methods. Tests of coatings in the ground by Pearson detectors will furnish the company with data for economic evaluation of materials and procedures after the new lines laid in the 1954 construction season have been in service.

In preparing this article, the author was assisted by Harry Moreland, president, and J. B. Lawson, vice president, at the Kansas City offices of Great Lakes before making a trip to contact spreads in Iowa and Minnesota.

Projects

The methods of coating the principal Great Lakes' projects in this year's 715-mile expansion program are indicated in the following:

Nebraska City to Doniphan, Neb., line of 132 miles, 8-in., contracted by R. H. Fulton & Co., was coated with coal-tar enamel at the railhead delivery points. This project was completed early this summer.

Kansas City to Des Moines line of 188 miles, 12-in., contracted by Midwestern Constructors, Inc., for 48 miles, R. H. Fulton & Co., for 71 miles, and M-R Co. for 69 miles, is coated over-the-ditch with coal-tar enamel.

Rosemount (near Minneapolis) to Alexandria, Minn., 163 miles, 12-in., contracted by Associated Pipe Line Contractors, Inc., for 80 miles (Rosemount to Rosendale), and by R. H. Fulton & Co. for 83 miles (Rosendale to Alexandria), is being coated over-the-ditch with asphalt enamel.

Alexandria to Fargo, N. D., 105 miles, 8-in., contracted by R. H. Fulton & Co., is yard coated with coal-tar enamel.

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EXPORT: CANADA—Engineering Specialties Co., Edmonton; COLOMBIA and VENEZUELA—Wilson, S. A., Caracas, Maracaibo and Puerto la Cruz. TRINIDAD—Wilson and Johnstone Ltd., Port of Spain.

Ill., southwest of Rochelle, 127 miles, 8-in., contracted by Mid-States Construction Co., for 62 miles (Mississippi River to Middlebury) and by M-R Co. for 65 miles (Iowa City to the Mississippi) is yard coated with coal-tar enamel.

Coating Materials

A recap shows that asphalt is applied on 163 miles—entirely over-the-ditch methods—and that coal-tar is used on 552 miles—232 miles by yard coating and 132 by application at the railhead and 188 over-the-ditch.

The scale on which railhead and yard applications of coal-tar are being used this year by Great Lakes represents a departure from the usual over-the-ditch methods for applying this material. About 5 years ago the company used pipe which was yard coated with coal-tar on a project between Barnsdall, Okla., and Independence, Kans.

After the line has been backfilled, pipe coating is subjected to resistance tests and those sections which do not meet specifications are repaired.

Coating Materials

The company establishes specifications for the material and type of application for coating each line section. Contractors furnish all primer, asphalt or modified coal-tar enamel, 15-mil. glass fiber, and 15-lb. asbestos coal-tar-impregnated and perforated felt wrapper.

The asphalt coating used is made by a process which makes it impervious to petroleum and overcomes previous objections to asphalt for pipeline coating. This asphalt is delivered wrapped in cardboard 100-lb. blocks that are readily cut in half and handled.

Nesters

The use of nesters for the protection of railhead and yard-coated pipe is a feature of the Great Lakes construction program this year.

A nester is a support for pipe made of steel with a sponge-rubber pad.

Pipe is placed in nesters when hauled for stringing and is placed in nesters when strung along the line to avoid damage to the coating. There are two nesters per joint of pipe. The contractor removes the nesters before lowering in. The company pays the contractors for the extra work and expense involved in using nesters.

Breaks in over-the-ditch coating are repaired by patch pads.

The use of yard and railhead-coated pipe has certain advantages in pipeline construction through removal of the cleaning-and-priming and coating-and-wrapping operations from the spread. But on the other hand there are special operations for the spread working with railhead and yard-coated pipe which involve the coating and wrapping of field joints and patching at bends and at the numerous places where coating is damaged in handling. The final economic evaluation of procedures must necessarily wait until the company's tests and studies are completed.

In his trip to Iowa and Minnesota, the author contacted the Midwestern spread on the Kansas City-Des Moines line and the Fulton spreads on the Rosendale-Alexandria and Alexandria-Fargo sections.

Pipe used throughout the projects laid by Great Lakes this year is X-42 and X-52.

Final test on the entire length of lines of newly completed projects consists of a 24-hour test under hydraulic pressure. In all cases the test pressure is well above any anticipated in operation and the amount imposed is in relation to wall thickness of the pipe. In addition to the pressure test, the company checks the cleanliness and interior construction of the pipeline by running a minimum of two scrapers.

Right-of-way is 30 ft. wide on the 8-in. and 50 ft. on the 12-in. Contractors are required to provide drags for ditches that will remove curved section from the bottom so as to permit the pipe to maintain a normal slack position.

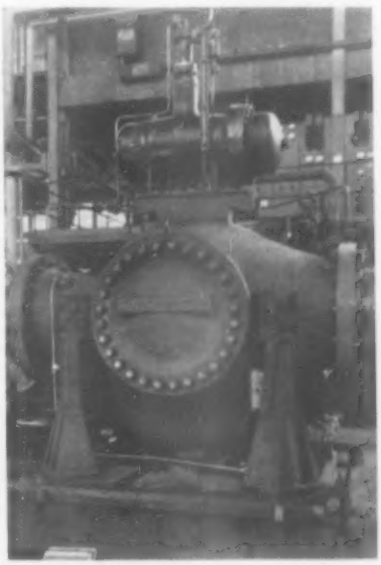
Welding

The Fulton spread on the Rosendale-Alexandria section was welding at an average rate of 8,000 ft. per day when operating near Glenwood, Minn. There were frequent interruptions from afternoon showers. On good days the output was as high as 11,000 ft. On the Rosemount-Rosendale section, also of 12-in. diameter, Associated is reported to have laid 2½ to 3 miles per day under favorable conditions.

Northern Natural Gets Centrifugal Compressor

THE latest design features are incorporated in the gas-turbine, centrifugal-compressor units which Northern Natural Gas Co. will install in its Macksville, Kans., booster station on the Oklahoma-Minnesota main line.

The centrifugal compressor will be the first stage unit in a four-unit station and will be driven by a 5,700-hp. two-shaft gas turbine. It is designed for a flow of 748 M.c.f. per day at a suction pressure of 434 psi. and a discharge pressure of about 500 psi. At this load, the compressor will absorb 5,200 hp. at its normal operating speed of 4,750 r.p.m.



New centrifugal compressor for Northern Natural Gas Co. shown while it was being tested in Worthington's Harrison shops. Tank atop unit is reservoir for bearing and seal oil.

Engineering features of the compressor include a main casing and shaft supports which will minimize shaft center-line distortions arising from the high casing pressure. Also, the casing is designed for a maximum working pressure of 1,000 psi. and for the use of different impellers in case flow and pressure requirements are changed. The barrel which supports the rotor shaft is carried on the casing cover and is easily removed through the front of the machine, simplifying impeller changes.

The compressor shaft seal is of the high-pressure-oil type which has been used extensively on machines of this type. An integral lubrication and seal oil system is independent of the gas-turbine lubricating system.

A single pump, mechanically driven from the compressor shaft, supplies both seal and lube oil. An elevated tank stores an emergency oil supply at a sufficient pressure to lubricate the oil seal and bearings in case of sudden pump failure. The system is designed so that an internal bearing mishap cannot cause starving of another bearing.

Miscellaneous level and temperature alarm devices are provided and most of the lube-system equipment will be housed in a separate console.

The new centrifugal compressor was manufactured by Worthington Corp., of Harrison, N. J.

Crude-Oil Absorption Clicks With Union

It's less efficient than conventional absorption, but its low cost often makes it a profitable operation

by J. A. Gordon

CRUDE oil can often be used advantageously for absorbing propane, butane, and heavier hydrocarbons from wet field gas. The method lacks the conventional absorption plant's efficiency, but because of its much lower installation and operating costs, the crude-oil plant can often earn more profit.

Advantages of the process include lessened fire hazards, and the fact that the plant can be used in remote or residential areas where space and equipment are limited. Likewise, the crude-oil plant runs unattended, under the supervision of production - department personnel.

Limitations of the method result from unbalanced oil-gas ratios which are caused by the more rapid decline of oil production. Foaming prevents use of the process with some crudes, and the process is usually limited to gas volumes below 5 M.M.c.f. per day.

Union Oil Co. earlier this year was granted a patent on the cold process and has completed three such plants since January 1950. The first two plants are still operating, but the third has been shut down. Additional volumes of gas were developed, and it became more economical to transport all the gas to a conventional absorption plant.

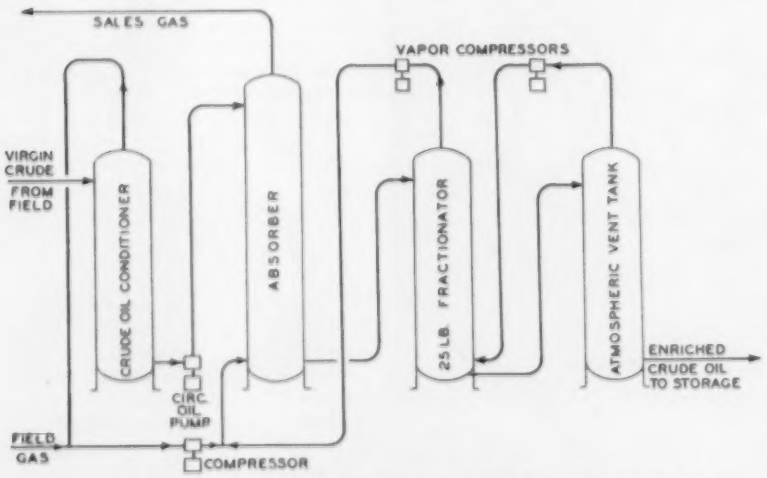
Author is associated with Union Oil Co. of California. Paper presented at meeting of C.N.G.A., Los Angeles, October 7, 1954.

First plant . . . Union's first crude-oil absorption plant was built in the latter part of 1949 and operation started on January 5, 1950. It is located in Sansinena field near La Habra, Calif. The field is situated in a residential area, the wells are drilled from "islands," and all the operations are subject to the approval of the Los Angeles County Planning Commission. Hence, it was imperative that a minimum of equipment be used, and it was also necessary that the plant run unattended.

The plant has operated with a minimum of attendance and, according to design, is currently treating approximately 5,000 M.c.f. per day of 300 psi. gas containing about 1½ gal. iC_4+ per M.c.f. and losing to the discharge about 0.3 gal. per M.c.f. of iC_4+.

Second plant . . . Union constructed its second crude-oil absorption plant at Grimes Canyon in Bardsdal field in Ventura County in 1951. Unlike the Sansinena plant which paid out on both the sale of gas and gasoline, this plant existed first as a compressor plant selling wet gas, the absorption part of this plant being installed at a later date.

This plant is actually situated in two different locations. A crude-oil storage tank and a compressor for conditioning and the oil circulating pump are located in Grimes Canyon. The remainder of the plant, consisting of the absorber, scrubber, fractionator, vent tank, and dehydrators, is located on a knoll about 800 ft. away. The plant currently treats approximately 2,400 M.c.f. per day of 500-psi. wet gas containing approximately 1½ gal. per M.c.f. of iC_4+ and discharges a tail gas containing 0.3 gal. per M.c.f. of iC_4+.



SCHEMATIC FLOW DIAGRAM for Union's crude-oil absorption plant. Fig. 1.

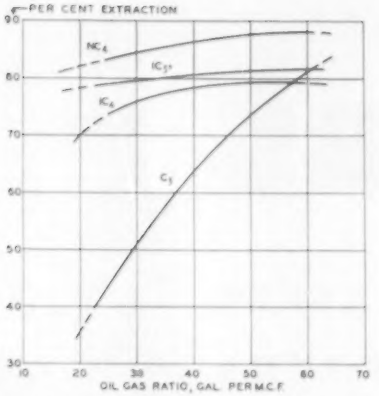
Process

The crude-oil absorption process is a "cold" process devoid of the usual boilers, heaters, heat exchangers, and cooling towers found in the conventional plant.

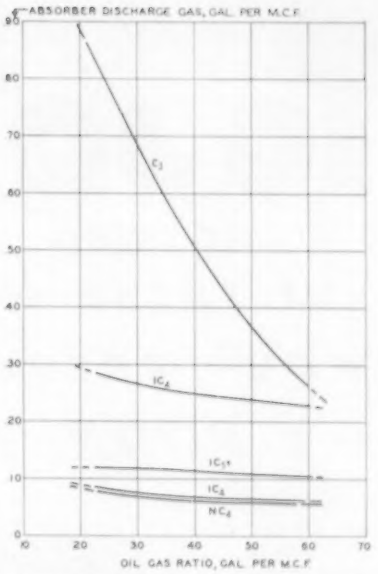
The main components of the process consist of a crude-oil conditioner, an absorber, a fractionator, an atmospheric vent tank, an oil-circulating pump, and three small vapor compressors for compressing vapors from the atmospheric vent tank, fractionator, and crude-oil conditioner.

Fig. 1 is a flow sheet of the system. Virgin crude oil from the field passes from field traps or lease tanks into the crude-oil conditioner. This vessel is maintained at about 12-in. vacuum by a small vapor compressor. Most of the gasoline vapors along with methane and ethane existing as contaminants in the crude oil are flashed off in this vessel. From here the oil is picked up by a circulating pump and pumped over the absorber where it is contacted with the wet-gas stream.

From the base of the absorber the enriched oil flows into a fractionator which is maintained at 25 psig., and it is contacted with gasoline-rich vapors from the vent tank over a series of five trays. After stabilization in the fractionator, the enriched stabilized crude oil passes to the vent tank which is maintained at a slight vacuum. Upon leaving the vent tank, the enriched crude oil is ready for storage or pipeline.



ABSORBER EFFICIENCY in the crude-oil absorption plant. Fig. 2.



GASOLINE CONTENT of the absorber discharge gas. Fig. 3.

The crude-oil conditioner has the very important function of removing the gasoline components from the crude oil since the main limitation of this process is the ability effectively to strip the crude oil of butanes and pentanes before using it as an absorbing medium.

At present approximately 12-in. vacuum is maintained on the conditioner. Stripping with dry gas has been used. It may be that more efficient conditioner operation could be obtained with a higher vacuum, or by the addition of heat, or both.

Absorber . . . The absorber operation is similar to that of a conventional plant, and extraction efficiencies can be calculated and successfully correlated. Oil rates must be adjusted to allow for the higher molecular weight of the crude oil. An average molecular weight for the crudes we have used is on the order of 380 as compared to about 180 for conventional lean absorption oil.

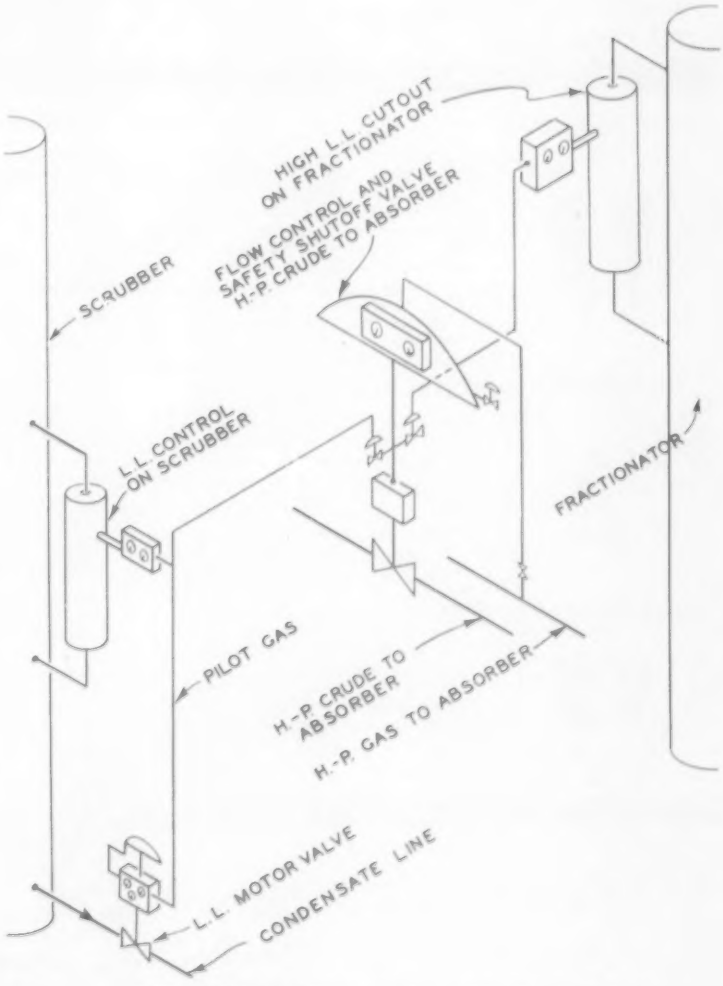
Figs. 2 and 3 illustrate the absorber efficiency and gasoline content of the absorber discharge gas as taken from actual plant tests at 305 psig. and 70° F. temperature. These curves indicate that oil-gas ratios above 33 do not yield enough additional iC_4+ to warrant the extra oil circulation required for the particular plant in question, and that ratios below this amount yield excessive losses of butanes and pentanes.

The curves tend to flatten and approach a limit beyond the desired oil-gas ratio. This is in contrast to theoretical calculations and can be attributed almost entirely to small quantities in the crude oil of the components that are present in the wet field gas. Higher absorber pressure will decrease these discharge losses somewhat, but will not entirely eliminate them.

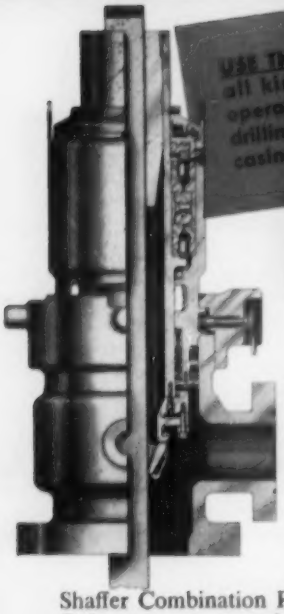
It is interesting to note the sharp increase in propane extraction with increasing oil-gas ratios. Propane more nearly follows the theoretical extraction because its higher vapor pressure allows it to be more effectively stripped in the conditioner and, of course, there is usually a higher concentration of propane in the treated gas.

Fractionator . . . The purpose of the fractionator is to reduce the recycle load to the absorber and to stabilize the oil for the pipeline. The ability of the enriched oil to remain in a liquid phase as pipeline oil depends almost entirely on the degree of fractionation prior to entering the pipeline system.

Since tank vapor losses are a function of the absolute vapor pressure, it is desirable that the enriched-crude absolute vapor pressure be reduced to its lowest value and still retain all the propane and heavier available. Fractiona-



CONTROL SYSTEMS for scrubber and fractionator. Fig. 4.



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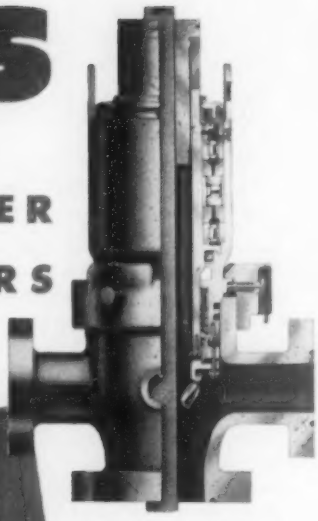

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USE THE TYPE 51 for slim hole drilling, drilling-in, re-work operations, production jobs, and similar applications.

CONTINUOUS SEAL

As long as the drill string is in the hole, a pressure-tight seal is maintained continuously and automatically. There is no need for applying mechanical or hydraulic pressure from the outside — there's nothing to remember or forget — and the seal automatically adjusts itself to the varying shapes and diameters in the drill string. The operator can drill under pressure, and can also strip pipe in and out of the well under pressure — all without adjustments or changes in the unit!

SEALS VARYING DIAMETERS AND SHAPES

In both units, the Stripper Rubber expands and contracts automatically to fit the varying diameters and shapes of the drill string (excepting such abnormally large diameters as bits and reamers). It seals around any shape — round, square, hexagonal or octagonal — and varying diameters of pipe, couplings, drill collars, subs, etc. No manual adjustment is necessary!

STEEL PROTECTED STRIPPER RUBBER

A patented expandable barrier of hinged steel latches prevents the Stripper Rubber from extruding — either by high pressure or by pulling large diameters through it. Yet flexibility of the rubber is assured.

EXTREMELY COMPACT

Both units are amazingly compact and can be installed under difficult space limitations. Not only are vertical and horizontal dimensions kept to the minimum, but even the flow connections are built directly into the body, simplifying hook-ups and eliminating need for spools or similar equipment.

LONG, TROUBLE-FREE LIFE

The Stripper Assembly rotates freely with the kelly — not one inside the other. Thus, there is virtually no wear on the rubber, assuring negligible maintenance and maximum safety. The bearing assembly upon which the unit rotates has separate thrust and radial bearings to withstand a combination of loads due to high pressure and high speed drilling — and bearings are prepacked with a high temperature and high speed stabilized grease.

LARGE DIAMETERS EASILY PASSED

Unusually large-diameter tools such as bits and reamers can be passed through the unit with maximum ease, safety and simplicity by merely pulling a spring latch and rotating the bonnet 1/6th turn, whereupon the entire internal mechanism can be withdrawn as a unit to permit passing the bit or reamer.

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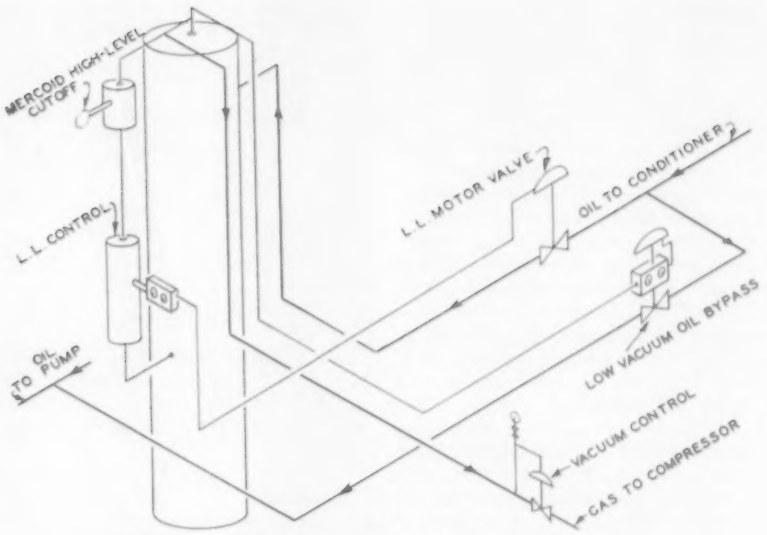


CONTROL SYSTEM on crude-oil conditioner unit. Fig. 5.

tion, therefore, is important to the process in that the removal of the methane and ethane will yield a correspondingly lower pipeline tank vapor loss in the subsequent handling of the enriched crude oil after it leaves the crude-oil absorption plant.

Furthermore, because of the wide difference in vapor pressure of the isobutane and methane for example, about 50 gal. of isobutane can be substituted for 1 gal. of methane without raising the vapor pressure of the crude oil.

The atmospheric vent tank is utilized in the process to take a final flash on the enriched, stabilized, oil prior to its entering storage or pipeline. A slight vacuum is maintained on this tank of approximately 0.1 in. water to allow any components to flash which did not do so in the fractionator.

This is supposedly the lowest pressure to which the oil will be subjected until it reaches its ultimate destination, and hence it should be quite stable at atmospheric pressure and at temperatures not exceeding those at which stabilization took place.

Processing Goals

In operating a crude-oil process, the following conditions should be fulfilled:

1. The conditioning of the crude oil should be as efficient as possible.

2. The absorber should be operated at the maximum pressure consistent with field operating conditions, sales line pressure, and economics of compression.

3. The fractionator should be so operated that the recycled vapors contain a minimum of gasoline components.

4. An oil-gas ratio should be maintained that will give a practical loss of iC_4+ not to exceed 0.3 gal. per M.c.f.

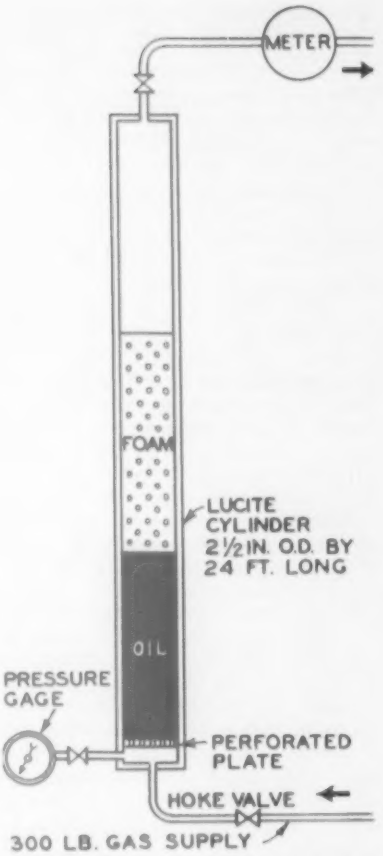
An example of the various plant streams is shown in a plant balance given in Table 1. This particular test does not reflect the best operation since the oil-gas ratio was only 27.9 gal. per M.c.f., but it serves to illustrate the various stream concentrations.

Several items are of interest from this balance. The tail gas loss is 0.286 gal. per M.c.f. of iC_4+. Absorber extraction is low for the pentane and heavier components which is reflected by the residual material left in the conditioned crude. However, the butane extraction is fair and the propane extraction is high in relation to the other components. Note the difference in propane extraction between the absorber and the plant as a whole, this difference being due to the high concentration of propane in the recycle vapors. Another interesting item is the low volume of recycle vapors which amount to about 7½ per cent of the total gas treated.

Instrumentation . . . For unattended operation, the process requires a few controls as illustrated on Figs. 4 and 5.

For the absorption vessels, a pilot-controlled motor valve on the crude oil to the absorber shuts off the flow of oil on high liquid level in the scrubber, on high liquid level in the fractionator, and on high gas pressure in the absorber.

On the conditioner unit a liquid-level controller maintains the level in the conditioner, but on high liquid level an electric switch grounds the magneto driving the vapor compressor. An additional safeguard is a low-vacuum oil bypass around the conditioner in order to insure adequate oil pump suction at all times.



FOAM-MEASURING APPARATUS indicates adaptability of an oil to crude-oil absorption. Fig. 6.

Selection of the Process

Crude-oil absorption is ideal for isolated locations in that (1) a stabilized enriched crude oil is provided for transportation of the gasoline, (2) a dry gas stream is available for fuel and sales, (3) there is no operating labor, (4) the initial cost is low compared to a conventional plant, (5) there are no boilers, cooling towers, heaters, heat exchangers or gasoline storage tanks, and (6) the return on the investment can be better than with a conventional absorption plant.

In selecting crude-oil absorption as a process over other means of treating gas, a complete study should be made in every case.

The anticipated crude-oil and gas quantities should be evaluated very closely. One disadvantage of crude-oil absorption is the lack of sufficient crude oil as the field declines. In many fields the oil declines more rapidly than the gas due to the liberation of gas with decline in field pressure. An example

of this is in Union's Grimes Canyon plant where the oil volume has declined to 670 bbl. per day while the gas volume has remained relatively constant at 2,400 M.c.f. per day at 500 psi. This is equivalent to an oil-gas ratio of less than 10. It has been necessary to evaporatively cool the oil and gas to keep the extraction at the design level, and in the future it may even be necessary to refrigerate the gas or bring in outside crude oil.

Evaluate foaming . . . The crude oil must be investigated for foaming characteristics since contaminants affecting surface tension can materially cause premature priming.

Union has developed an empirical method for evaluating a crude oil's adaptability to crude-oil absorption. Fig. 6 illustrates the apparatus. It is made from a lucite pressure-gravity cylinder and has a perforated tray near the bottom. The crude oil to be tested is poured into the cylinder to a depth of 8 in. and with the discharge valve closed a wet gas at 300 psi. is introduced through a Hoke valve. When the desired pressure is obtained, the outlet valve is slowly opened until a foam thickness of an additional 8 in. is obtained and remains constant. The meter is read in cubic feet per minute.

This apparatus simulates the top tray action of an absorber. Gas rates through the unit when operating with a constant 8-in. head of foam indicate the crude oil's adaptability to the process. In general, gas rates over 3 cu. ft. per minute would be considered good but oils have been used successfully with a rate of 2 cu. ft. per minute which is considered a minimum. It is interesting to note that gravity apparently does not have a bearing on a crude oil's process adaptability.

Gasoline in oil . . . The amount of gasoline in the crude oil is perhaps one of the most important factors to be evaluated in the selection of a crude-oil absorption plant as these constituents set the equilibrium at the top tray of the absorber which directly affects the tail-gas gasoline concentration.

If possible, the virgin crude oil should be analyzed for gasoline component content, and a laboratory test should be run to see the effect of conditioning the crude.

The following is a comparison of the amount of gasoline components in a virgin and conditioned crude oil taken from actual operation:

	Liquid per cent	
	Virgin crude oil	Conditioned crude oil
Ethane	0.12	0.06
Propane	0.62	0.37
Isobutane	0.49	0.36
Normal butane	1.58	1.03
Isopentane	1.19	1.19
Normal pentane	1.90	1.66
Hexanes plus	94.10	95.33
	100.00	100.00

While these differences are small, they are all important and any further reduction of the gasoline constituents would increase the plant extraction efficiency.

Gas pressure . . . The available gas pressure is another item that must be evaluated. Crude-oil absorbers should be operated at a minimum pressure of 300 psi. for reasonable extraction. In some cases this may entail extra expense for compressor investment and operation, especially if the sales-gas pressure is lower than the absorber pressure.

The temperature of the crude oil is

TABLE 1—PLANT BALANCE—SANSINENA CRUDE-OIL ABSORPTION PLANT

	Plant intake		Absorber intake gas				Absorber discharge gas			
	M.c.f./D.	G./D.	Mole %	G./D.	M.c.f./D.	G./D.	Mole %	G./M.	M.c.f./D.	G./D.
H_2O, CO_2, air	324		4.35		263		4.90		262	
C_1	4,569	77,624	80.21		4,850	82,399	85.92		4,587	77,931
C_2	300	7,661	5.99		362	9,244	5.46		292	7,457
C_3	228	6,297	5.37	1.481	325	8,956	2.88	0.794	154	4,240
iC_4	54	1,777	1.24	0.406	75	2,455	0.26	0.085	14	454
nC_4	75	2,357	1.60	0.505	97	3,054	0.23	0.073	12	390
iC_5+	69	2,578	1.24	0.476	75	2,878	0.35	0.128	19	684
Total	5,619	98,294	100.00		6,047	108,986	100.00		5,340	91,156

	Fractionator vapors				Vent tank vapors			
	Mole %	G./M.	M.c.f./D.	G./D.	Mole %	G./M.	M.c.f./D.	G./D.
H_2O, CO_2, air	8.60		35		6.90		10	
C_1	42.22		173	2,939	7.54		11	187
C_2	14.65		60	1,532	12.68		19	485
C_3	23.02	6.347	94	2,596	43.49	11.991	65	1,799
iC_4	4.60	1.507	19	616	11.02	3.611	17	542
nC_4	4.68	1.477	19	604	12.00	3.788	18	568
iC_5+	2.23	0.851	9	348	6.37	2.459	10	369
Total	100.00		409	8,635	100.00		150	3,950

	Virgin crude oil		Conditioned crude oil		Enriched crude oil	
	Liq. %	G./D.	Liq. %	G./D.	Liq. %	G./D.
C_1	0.00		0.00		0.00	
C_2	0.04	67	0.04		0.08	141
C_3	0.26	439	0.19		1.33	2,347
iC_4	0.18	304	0.17		0.98	1,729
nC_4	0.47	793	0.33		1.31	2,311
iC_5+	99.05	167,069	99.27		96.30	169,921
Total	100.00	168,672	100.00		100.00	176,449

	Calc. gasoline prod.			Metered gasoline prod.		Efficiency (%)	
	Mole %	M.c.f./D.	Liq. %	G./D.	Liq. %	G./D.	Plant	Absorber
C_1								
C_2	3.40	8	2.74	204	0.95	74		
C_3	31.49	74	27.63	2,057	24.53	1,908	32.7	52.7
iC_4	17.02	40	17.77	1,323	18.32	1,425	74.5	81.5
nC_4	26.81	63	26.42	1,967	19.52	1,518	83.5	87.2
iC_5+	21.28	50	25.44	1,894	36.68	2,852	73.5	76.2
Total	100.00	235	100.00	7,445	100.00	7,777		

another important item when considering crude-oil absorption. In many cases the crude oil is heated for dehydration and it is not feasible to cool the oil before shipping. The temperature is very important since it affects the vapor pressure of the components being extracted which is further complicated by the presence of gasoline in the oil on the top tray.

Oil-circulation rates are limited as extractions approach a maximum due to the degree of contamination of the crude oil. It is characteristic of the equilibrium at the top of the absorber for the iC_5+ content of the discharge gas to increase as the oil circulation is increased under the same operating conditions of temperature and pressure and crude-oil contamination.

The degree of conditioning is limited to the amount of horsepower that can economically be installed if the process is to remain cold. If heat is applied, then more equipment is required for heat and exchangers and it becomes an economic problem of high temperature in the conditioner versus low temperature in the absorber.

High oil-circulation rates are required compared to the conventional. Also, more propane in proportion to iC_4+ is extracted which may or may not be desirable.

The crude-oil process is limited to the smaller volumes of gas to be treated, say on the order of 4 or 5 million cubic feet per day. The losses incurred with gas volumes greater than this often make it desirable to treat the gas by some other method; however, each individual case must be independently evaluated.

Economics . . . An example is given in Table 2 in which the crude-oil plant is compared with a conventional plant required to treat 5,000 M.c.f. per day of a wet gas containing 3 gal. per M.c.f. of isobutane and heavier.

Evaluating the operating maintenance, depreciation, etc., costs along with the loss of revenue due to process efficiency and fuel consumption, Table 2 indicates that the difference in revenue from the two plants is approximately 0.53 gal. per M.c.f. of gas treated. This means that the crude-oil plant can earn more profit than the conventional absorption plant in this case since the loss of iC_4+ over the conventional plant is only 0.25 gal. per M.c.f.

In many cases where this type of evaluation is close, other factors considered are location, volume of gas to be treated, anticipated life of the field, and other uses for the additional money required for the conventional plant.

Operating Problems

The crude-oil absorption plant has certain operating problems some of which are common to most treating plants and some which are peculiar to itself.

The gas usually must be compressed. Usual compressor operating and maintenance problems are no different from conventional. If the pressures are high and atmospheric temperatures are low, gas dehydration may be necessary.

Under certain conditions, oil foaming may present a problem. The use of Dow-Corning silicones has proved effective when the problem has arisen.

There is always the problem of an unbalanced oil-gas ratio due to the more rapid decline of the gas than the oil. In the Sansinena plant it was necessary to pump and transport oil from another location over 6,000 ft. distant. At the Grimes Canyon plant it became necessary to cool by water evaporation both the gas and oil streams. A wax problem has been encountered in the oil cooling which limits its cooling to about 60° F. Refrigeration of the gas is a future prospect or bringing in additional oil may even be necessary if the oil declines at the present rate.

Metering problems . . . Another problem encountered with the crude-oil absorption plant is the accounting of royalties, etc. Fractional analysis or charcoal tests of the gas to and from the plant can be taken and the difference calculated as the volume of gasoline. This method is cosely and at best only gives a spot sample which does not account for the temperature and pressure variations which affect the gasoline content.

Another and more reliable method is to measure the volumes of virgin crude and enriched crude either by tank gages or displacement meters. In the case of the meters, it is necessary to have a test meter or prover tank available as any measurement error in either stream will affect the accounting. The difference in meter readings gives the volume of gasoline absorbed and the gravity of the product can be calculated from the differences in gravity of the virgin and enriched crude streams.

Another problem encountered where a long oil line existed between the conditioner and the absorber at the Grimes Canyon plant was the heat pickup in the oil line due to exposure to the sun. A 10° decrease in daytime temperature was obtained after the line was painted white.

Minimum attention . . . Other operating problems are negligible since there is very little equipment to operate. The small vapor compressors require a minimum of attention and there is the usual care given to instruments such as orifice meters, liquid level controls, relief valves, etc.

The plant runs unattended. Except for occasional labor required for pump and equipment maintenance, the actual operating labor required amounts to only several hours per day.

Operating costs are considerably lower than the conventional absorption plant. Apart from compressor fuel and a small amount of recycle fuel required, which is equal to or less than the conventional plant, there is no additional fuel required except for instrumentation.

Other direct operating costs which are attendant upon operating labor are also minimized. Direct operating costs, exclusive of fuel, for a crude-oil absorption plant may run as low as $0.005 per gallon as compared to $0.015 per gallon for a conventional plant of the same capacity.

TABLE 2—COMPARISON OF CONVENTIONAL AND CRUDE-OIL ABSORPTION PLANT COSTS FOR 5,000-M.C.F. PER DAY TREATING PLANT

	Conventional	Crude-oil absorption plant
Investment	$200,000	$60,000
Fuel required, per cent	6	1
Operating and maintenance, per gallon	$0.015	$0.005
Gasoline content of residue gas (iC_4+), gal. per M.c.f.	0.05	0.30
Operating and other costs:	$/D.	$/D.
Operating and maintenance cost (15,000 gal. per day)	225	75
Depreciation (10-year writeoff)	55	20
Ad valorem taxes at 2 per cent per year	11	3
Insurance	1.50	0.50
Interest on investment at 5 per cent	12.50	4.20
Loss of revenue due to process efficiency and fuel:		
Loss of gasoline at 10 cents per gallon	25	150
Value of fuel at 25 cents per M.c.f.	75	10
Total operating and product loss	405	263

Difference $405 − $263 = $142 per day; at 10 cents per gallon = 1,420 gal. per day; = 1,420/5,000 = 0.28 gal. per M.c.f. permissible loss in addition to the 0.30 gal. per M.c.f. actual loss with the crude-oil absorption plant.

Maybe Cathodic Protection's the Answer

. . . to your problem of external well-casing corrosion

There has long been a need for an economical, reliable method of determining the current requirements to protect oil-well casing from external corrosion. The author describes in this article a method that does not require pulling the tubing but that checks with down-the-hole surveys.

by Yale W. Titterington

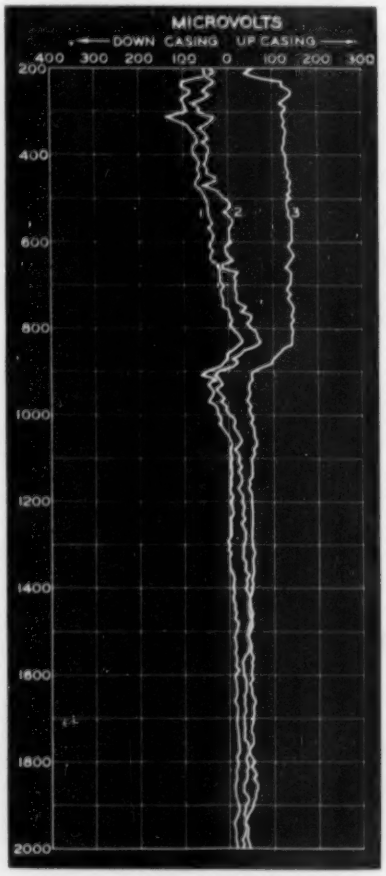
MANY wells, in which a small leak developed in the casing, have been abandoned either because they were marginal producers, or because the well was lost in trying to plug the leak. For that reason, increasing interest has been manifested by major producers in the use of cathodic protection as a means of mitigating external corrosion of well casing.

A tool has been developed which can help in fields where casing corrosion is a problem, in determining whether external or internal corrosion is involved without having to pull the casing for visual inspection. This tool consists essentially of two sets of spring-loaded contact points located from 10 to 20 ft. apart.

The usual procedure in running such a test is first to insulate the well from all other metallic structures such as flow lines and fuel lines. After the well is electrically isolated, the tool is lowered into the casing to some predetermined depth below the corroding areas (usually to a depth of from 2,000 to 5,000 ft.). The IR drop or potential difference between the contact points at either 10 or 25-ft. intervals, depending upon the gap separation between them, is measured up to the top of the well using a potentiometer circuit modified to read in microvolts. Unfortunately, due to the possibility of varying electrical resistance between contact points, a quantitative determination of the amount of current either entering or discharging from a given section can not be made. Rather, the emphasis should be placed on trends which indicate potential corroding areas.

An actual survey . . . A typical potential drop survey run on a well in Kansas is given in Fig. 1. This well was tested with a spacing of 10 ft. between contact points. Curve 1 is the potential drop profile showing the effect of having the flow line electrically connected to the well, as against curve 2 where the flow line was insulated off. The difference in these two curves is caused by a current of 0.75 amp. entering the casing from the flow line when the two are metallically connected. Curve 3 shows the effect of applying 1.24 amps. of protective current to the casing from five 50-lb. magnesium anodes located 125 ft. out from the well.

In interpreting the curves in Fig. 1, all points on the left of the zero line indicated current flowing down the casing whereas, every point right of the zero line represents current flowing up the casing. The slope of the curve is an indication of the passive and corroding areas with a positive slope denoting an area of current pickup and conversely a negative slope an indication of corrosion. In the actual interpretation of these curves the gross anodic (corroding) areas indicated by curve 2 are at depths of 470 to 510, 740 to 830, and 910 to 1,060 ft. For curve 3 the only interpretation is that the protective current of 1.24 amps. was sufficient completely to protect this well.



TYPICAL POTENTIAL-DROP survey on a well in Kansas. Fig. 1.

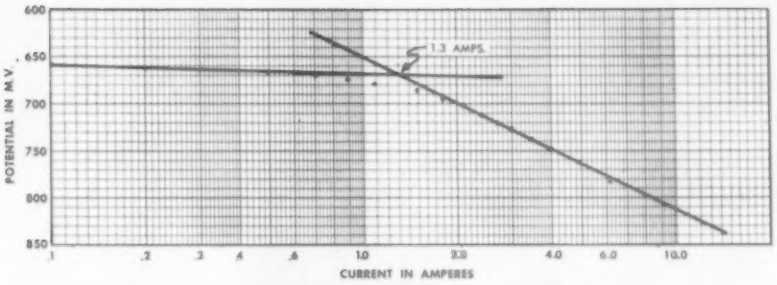
Large current not required . . . This brings up a point which has caused many to doubt the possibility of protecting oil-well casings with such small current requirements. This conclusion has been drawn from the much higher current requirements needed to protect shallow buried horizontal pipe lines. The obvious reason for this apparent discrepancy is the presence of an active depolarizer—oxygen—around pipelines and its absence in the formations around well casings.

Once it has been established, either through a potential drop survey or a visual inspection of pulled casing, that external corrosion is the prime factor in perforations, this can definitely be arrested by some form of cathodic protection. The current source, either magnesium anodes or rectifiers, is immaterial. However, in many cases due to the lack of electrification, magnesium anodes can be but the sole current source.

Within the past few years numerous wells in Texas, Kansas, Illinois, Louisiana, California, and other areas have been tested for external corrosion and the current required for protection determined by the potential drop method. The amount of current required has ranged from 0.3 to 2.0 amps.

A new method . . . Recently, the author has perfected a simple and economical method, together with instrumentation, for determining the current required per well for protection. With this method, which has been proved ac-

Author is president, Corrosion Services, Inc., Tulsa and Sand Springs, Okla.



TYPICAL CURRENT-REQUIREMENT curve run on a well in Oklahoma. Fig. 2.

curate by a number of checks made against potential drop surveys, the determination can now be made by simple surface-potential measurements made while the well is in operation. Essentially, the method consists of determining polarization potentials of the casing for various values of impressed current by measurements made at the surface. The values of current are then plotted against the potentials and the break in the curve is used as the current required.

A typical current-requirement curve run on a well in Oklahoma having a total depth of 5,400 ft. is given in Fig. 2. The indicated current requirement for this well was 1.3 amps.

While excellent correlation has been obtained to date between this and the potential drop method, there will still be justification in new fields where no previous cathodic protection data are available to make a down-the-hole survey on one or two wells to check the accuracy of the surface-potential results. Using this method the current requirements for a well can be determined within 1½ hours with the only work on the well being the clamping of a wire to the well-head assembly.

Cathodic protection of the casing of a well involves a simple installation as shown schematically in Fig. 3. The only factors involved in designing such an installation are:

1. Insulating the well from all other metallic structures.

2. Locating an area of lowest resistivity soil at a minimum distance of 100 ft. out from the well.

3. Determining the total current required.

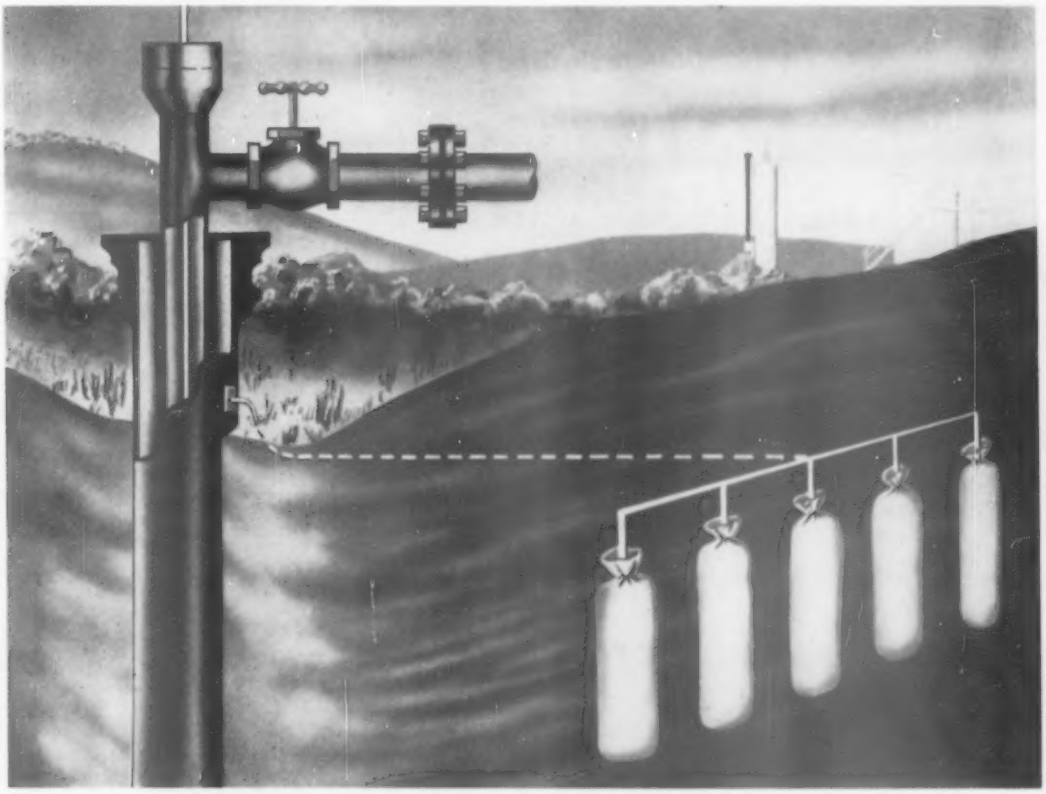
4. Determining the number of magnesium anodes to give the total current required.

5. Calculating the life of the protective installation.

As a guide in helping those companies unfamiliar with this application, it is generally agreed that the company's interest is best served by requesting that a bid price be submitted on the basis of applying a predetermined current per well for an installation life of 10 or 15 years.

WE GIVE CREDIT . . .

We failed to give credit for the article, **Defining Water Tables of Petroleum Reservoirs,** by Carroll F. Knutson, issue of September 27, page 78. This material was adapted from a paper which originally appeared in Bull. A.A.P.G., Vol. 38, No. 9 (September 1954).



SIMPLE INSTALLATION required for cathodic protection of well casing. Fig. 3.

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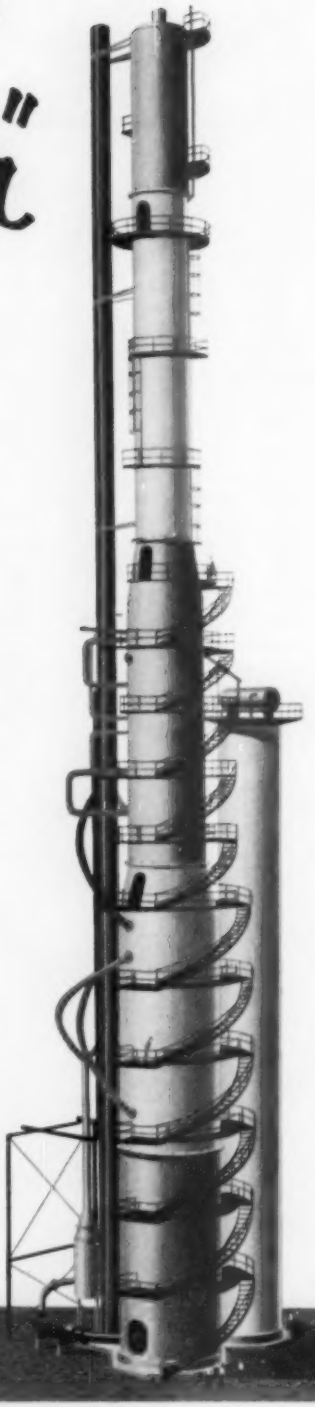

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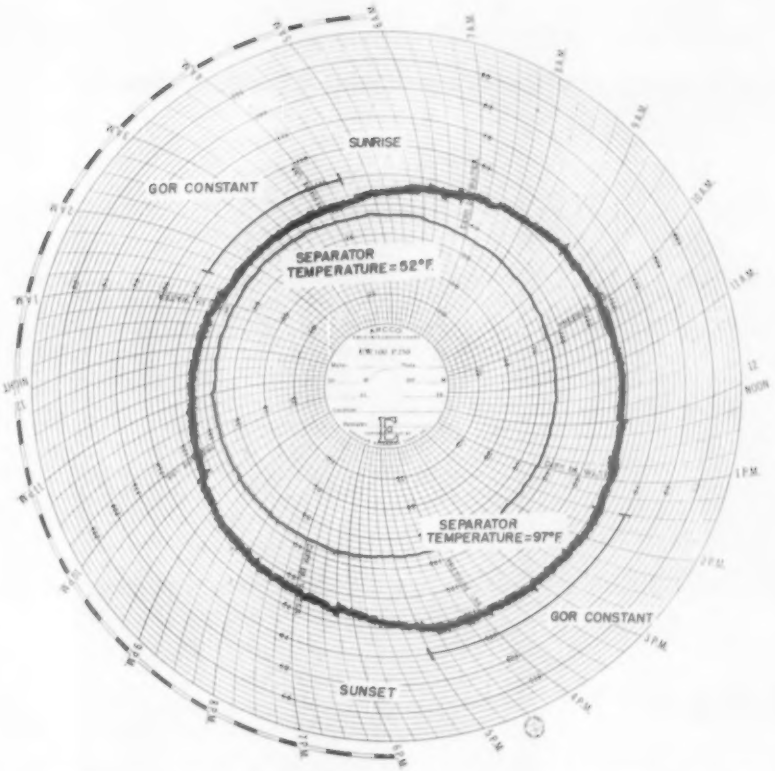

Fig. 1—Orifice-meter chart showing changes in gas volume due to temperature variations.

Fig. 2—West Texas separators. Problems of well conditioning can be simplified if sampling is performed as soon as possible after completion.

Better Separator Sampling Of Crude-Oil Reservoirs

When the need arises to recombine separator samples in order to determine properties of the reservoir fluids, care must be exercised to recombine the fluids in proper proportion. Here are things to look out for in achieving correct fluid proportion

by F. O. Reudelhuber

THE properties of oil reservoir fluids are determined in the majority of cases using subsurface samples collected with special wire-line equipment. In some instances, however, samples of separator liquid and vapor are recombined to yield a fluid which simulates the reservoir material. Three requirements must be met, before the recombined fluid can actually be representative:

1. The produced ratio must be representative of the actual solution gas-oil ratio of the reservoir fluid.

Author is division manager, Core Laboratories, Inc., Dallas.

2. This ratio must be accurately determined.

3. The produced fluids must be recombined in proper proportions in the laboratory.

The first of these is not controllable in the majority of cases, while the third is a matter of laboratory concern. The second requirement, however, is of paramount importance and can be satisfied with sufficient care and proper techniques.

Well conditioning . . . Choice of the proper rate of flow for the conditioning and sampling operations is entirely a matter of well productivity. As a basic guide, the rate selected should be the minimum which will result in stable flow. Problems of well conditioning can be simplified if the sampling is performed as soon as possible after completion. Further, the fluid flowing into the well bore at this time is more nearly representative of the reservoir material than during any other period.

Although some delay is necessary to allow removal of drilling fluid and filtrate, gas-oil-ratio tests should begin immediately after this initial flow period. A prolonged conditioning period is not required and the tests to determine the ratio which will be used for subsequent recombination may therefore be initiated after some 5 to 7 days of production.

Testing procedures . . . A minimum period of 72 hours is normally sufficient to perform the required gas-oil-ratio measurements. Tank gages should be made at 6 to 8-hour intervals and ratios calculated for these and for extended periods. The short tests should be plotted as a function of separation

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"Samples should be collected when separation temperature will remain constant"

temperature for subsequent use in selecting the gas-oil ratio corresponding to the temperature at which the samples were collected. The extended ratios are to be used only as a means of ascertaining if the well is producing at a stable rate.

Separation temperature . . . The ratio in which oil-phase production separates into gas and liquid is significantly affected by changes in separator temperature. The use of long exposed flow lines and the relatively small volume of fluid flowing through these lines causes the effect of ambient temperature to be very pronounced. A regular, systematic change in the operating temperature of the separator is apparent from examination of most orifice-meter charts. This variation can become quite severe and is translated directly into error throughout the sampling and analysis if not properly taken into account. In West Texas, for example, a diurnal change of 40° to 50° is not uncommon and changes of this magnitude result in gas-oil-ratio variations of as much as 15 to 20 per cent.

It is obvious that samples collected at some specific temperature can not be recombined in the average ratio measured over a period when such wide changes in temperature have occurred. The extent of this variation must be determined and proper methods employed to include this factor when necessary in selection of the ratio to be used for recombination.

The separation temperature is best determined at the vertical section of the flow-line immediately ahead of the tangential inlet to the separator. A standard mercury thermometer taped to this line in a sheltered position and partially covered with insulation is often sufficient for measurement of the separation temperature. A recording thermometer is preferable, however since personnel need not continually be present to read hourly temperatures.

If the meter run is adjacent to the separator, this same temperature may also be employed in the gas-volume calculations. Conversely, if a thermal well is available in the meter run, the temperature at this point may be used for both purposes. The ideal approach would require measurement of both, each for its own use; however, practical limitations permit a compromise.

Gas measurement . . . Customary methods may be employed in measurement of the produced gas volume. All equipment should be very thoroughly checked, however, and replaced where necessary. Every effort should be made to avoid low meter readings and equipment should be selected to allow all measurements to fall within 30 to 80 per cent of the meter range. In view of the precision required for these tests, orifice well testers should not be used.

Liquid measurement . . . Liquid production from crude-oil reservoirs will normally be of sufficient magnitude to permit accurate volume measurements. Use of the suspended gage line and proper methods of time recording are very necessary and both should be employed.[1] The produced liquid volume should be corrected to standard conditions for ratio calculations. This is quite difficult since the temperature in the stock tank is essentially indeterminate when tests cover periods of several hours. The thermal gradients which exist in storage tanks practically preclude measurement of the effective temperature.

It has been found that satisfactory correlation can be made if the average separator temperature over the test interval is used as a basis for correction of the produced stock-tank volume. While this procedure is not completely rigorous, it is obviously superior to neglecting the temperature correction. Both separator and tank are subject to somewhat similar effects of ambient temperature and radiation and this approximate procedure is acceptable.

Water production . . . The production of water during the testing period can cause serious difficulties. Regardless of the source of this water, it invariably is not produced at a constant rate due to the low velocity of the well stream. The only method which will yield an acceptable measurement of this material is actual gaging of its volume in the tank. The use of shakeouts is unacceptable since this method offers no means for measurement of free water. The practice of draining water from the tank bottom is also very unreliable and does not yield accurate results. The use of water-finding paste is far superior.

A fairly stable emulsion is sometimes found at the oil-water interface which will result in indistinct level measurements. This may sometimes be corrected by moving the gage line weight slowly through this interface several times before dropping the line to the point at which reading is made. If this alone is not successful, a small flat plate may be welded to the bottom of the weight. In either case, the purpose is to displace the emulsion momentarily and allow the clean fluids to enter the area immediately surrounding the gage-line.

Sampling

Samples should be collected at a time when the separation temperature will remain fairly constant over the sampling period. The magnitude of the temperature is unimportant; however, an acceptable ratio must have been determined to correspond to the sampling temperature. Due to the temperature-induced variations, it is difficult to set any criteria for the limits of ratio deviation.

The sampling personnel must decide if sufficient information has been acquired to determine the ratio in which the fluids were being separated at the time of sampling. It should be borne in mind that any error in the ratio will be transmitted in a corresponding degree to the laboratory results.

The samples may be collected in any of several manners. The procedure most commonly used for liquid samples requires containers with valves at each end. The container is filled with water and placed in a vertical position. The liquid source, normally the separator sight glass, is connected to the top valve, the line is pressured and purged, the container is pressured, and water is withdrawn until the desired amount of sample collected. The usual procedure is to collect sufficient sample to displace 75 per cent of the water. An additional 15 per cent is then withdrawn with the top valve closed to form a gas space for possible expansion resulting from heating in transit.

The gas samples are normally collected from the pressure taps at the flow meter. An evacuated container with valves at each end is used. The connecting line is purged under pressure and the inlet valve opened. Gas is allowed to flow into the container until no further audible flow is noted. A few minutes are allowed following which the outlet valve is opened very slightly and gas permitted to flow through at a low rate for several minutes before closing both container valves.

If practical, both gas and liquid samples should be collected at the same time to avoid an unnecessarily extended sampling period.

Reference

1. Reudelhuber, F. O., "Separator Sampling of Gas-Condensate Reservoirs," The Oil and Gas Journal, June 21, 1954, pp. 138-140.

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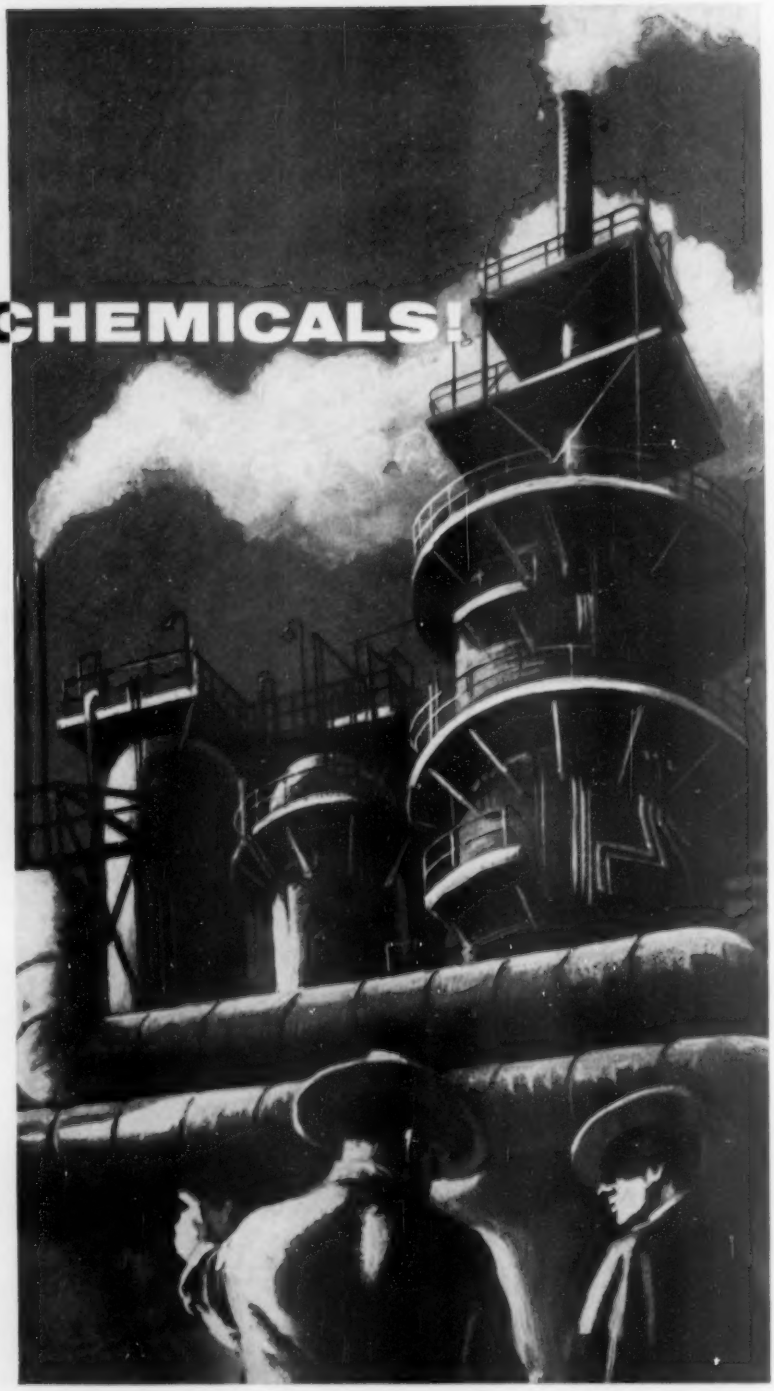

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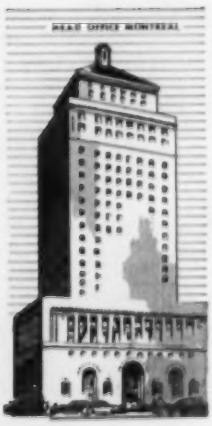

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Using More Natural Gasoline In Motor Fuels—3

by T. W. Legatski and H. J. Elder

IT is assumed that any gasoline formulations satisfactory for the very hot central area of the country would also be more than satisfactory in areas of lower temperature. On that basis we have examined the over-all average composition of motor gasolines, both premium and regular, and have reached the conclusion that an additional 4.2 per cent of butane could be blended on the average during the summer months without increasing the incidence of vapor lock. The final products would then fall along the proven "prevailing practice" guide line established in the Central Kansas survey.

The figure of 4.2 per cent of butane is conservative for two reasons. First, the established guide lines for the hot central area are too low for areas of lower temperature. Second, it should be remembered that what we have termed as the prevailing practice guide line is not a limit. There is a very substantial amount of information which indicates that all refiners could immediately go to the "less conservative" guide line without encountering difficulty. If these items are taken into account, the permissible increase in the butane content of average summer gasoline would be about 6.3 per cent instead of the previously calculated 4.2 per cent.

The volume of butane equivalent to 4.2 per cent of the motor-fuel production over the 6 warmest months of the year adds up to over 25,000,000 bbl. If one is willing to assume a differential of 10 cents a gallon between the motor-fuel value and the boiler-fuel value of butane, savings of around $100,000,000 can be visualized as possible through the proper blending of available butane.

In Table 1 the additional daily income from blending butane to proven limits is shown for various assumed combinations of current distillation and vapor-pressure characteristics. Results are in thousands of dollars per day per 100,000 bbl. per day of motor-fuel-production capacity. Even if the assumed differential value is halved as might be justified in special situations, the daily earnings are still of such a magnitude as to warrant an early look by motor-fuel manufacturers.

Authors are with Phillips Petroleum Co. From paper given at N.G.A.A. Dallas meeting.

Sources of butane . . . Up to this point we have been considering proper butane utilization without regard to source of butane. That approach appeared to be sound for the reason that, in the absence of special processing facilities at refineries for the conversion of butane and butylenes, all refineries have a surplus of these materials over and above motor-fuel blending needs. However, since those refineries which are equipped with conversion facilities could in all probability utilize some outside butane advantageously when blending to the proven limits, some consideration should be given to the ratio of volumes involved.

The results of such attempted comparisons are interesting to say the least. In Table 2 a summary of estimates on the butane-natural-gasoline picture is presented. These figures represent our interpretation of information from various sources on the quantity and quality of natural gasoline produced during the year 1953 as related to the butane volumes which could have been blended, but were not, during the summer months of 1953.

Attention is directed particularly to the last four items of this table. In those four items can be found the reason for the 25-year-old interest of this industry and the refining industry in the elimination of fuel-system restrictions. The last item in this table indicates that optimum butane utilization is equivalent to a cost-free upgrading process for octane improvement. Although it may ultimately be necessary to improve upon the antiknock characteristics of the low-volatile one-third of natural gasoline, it would seem that a more immediate problem would be to insure the optimum use of the octane numbers already present in the balance of the product.

TABLE 1—INCREASE IN DAILY INCOME ATTRIBUTABLE TO BUTANE BLENDING[1]
(In thousands of dollars per day per 100,000 bbl. of gasoline capacity)

Present average 30% evap. temp., °F.	Present average A.S.T.M. Reid vapor pressure 6	7	8	9	10
150			2.94		
160		13.00	6.30		
170		15.50	10.50	3.78	
180		19.70	14.30	7.98	0.42
190	30.20	23.90	19.30	13.40	5.04
200	33.60	27.70	21.80	16.40	7.98
210	36.90	30.60	25.20	16.80	

Notes: [1]It is assumed that butane will be added in amounts required to cause final blended product to fall on "prevailing practice" guide line. Butane is valued at $4.20 per barrel.

TABLE 2—RELATIONSHIP OF BUTANE VOLUMES WHICH COULD HAVE BEEN BLENDED IN 1953 TO THE ESTIMATED NATURAL-GASOLINE PRODUCTION OF 1953.

	Monthly averages Summer	Winter
1. Estimated average vapor pressure of natural gasoline	14 lb.	22 lb.
2. Estimated volume of natural gasoline produced, bbl.	9,100,000	10,919,000
3. Estimated volume of 12-lb. natural gasoline produced, bbl.	8,730,000	8,730,000
4. Butane blended from natural gasoline sources, bbl.	370,000	2,189,000
5. Additional butane which could have been blended, bbl.	4,200,000	(1)
6. Potential blendable natural gasoline, (3+4+5)	13,300,000	(1)
7. Approximate butane content of 6, per cent	34.4	(1)
8. Approximate vapor pressure of 6, pounds	26+	(1)
9. Potential increase in natural gasoline production, per cent	46	(1)
10. Octane number increase attributable to additional butane	5+	(1)

Note: (1) Not estimated for winter volumes.

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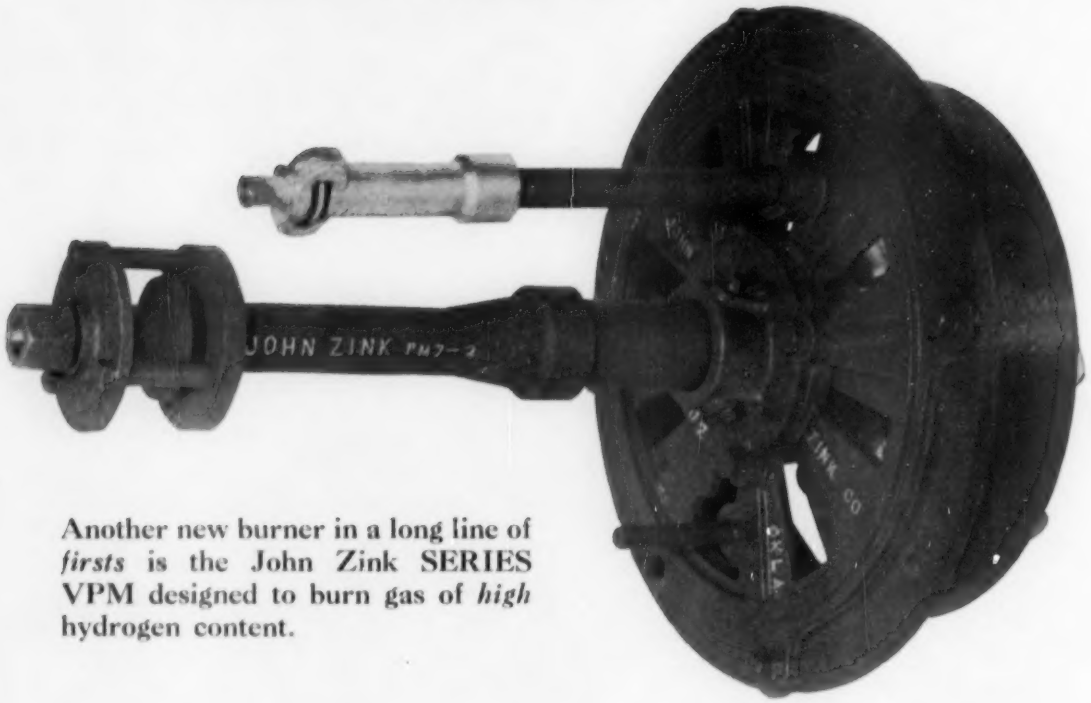

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by W. S. Worley

V-Belt Drives for Slush Pumps—3

A HORSEPOWER rating does not mean that the belt will not be physically capable of transmitting more or less horsepower than the rating. It simply means that for a given set of conditions the belt may be expected to transmit the rated horsepower for some average service which is either expressed or implied. When a drilling contractor operates a V-belt drive with only half its original complement of belts, he is not exceeding the capacity of the belts. He is merely assigning, by his action, twice the original rating to each belt, and asserting that he will be satisfied with the resulting decrease in belt service.

Indeed, it was the willingness of the contractor to operate with fewer belts, together with the general practice of designing slush-pump drives with higher ratings than previously published, which led to an investigation of the requirements of a satisfactory drive for slush-pump service. This investigation disclosed:

1. Many V-belts are accidentally destroyed, lost, or discarded in the course of a move, and others are accidentally lost during operations. As one contractor expressed it: "We lose fewer belts through use than through abuse."

2. Because of this rate of accidental or incidental replacement, V-belt drives which would normally give 7 to 10 years service on an industrial application are not only unnecessary, but impractical.

3. A drive which will give 2 years of service when not interrupted by accident or loss would prove satisfactory to the drilling contractor.

4. In even the most effective operations, the pumps are in service only half of the elapsed time. This means that in 2 years of service the pump will operate between 6,000 and 9,000 hours.

The above findings indicated a need for horsepower ratings for V-belt drives in slush-pump service which would be easily used, and which would have the special requirements of a slush-pump service as a basis. The following assumptions seem valid:

1. The ratings will be based upon 10,000 hours of average belt service. This should result in drives giving from 2 to 4 years service.

2. The speed ratio between pump sheave and power-takeoff sheave will be assumed to be greater than 2.50. This sets the ratio between the equivalent diameter and the actual driver diameter at 1.13.

3. The belt length will be assumed at 330 in. Because the belt length is involved in determining the fatigue life required of the drive, provision for allowable increases in horsepower rating will be necessary for belts of substantially longer length.

4. The arc of contact at the small sheave will be considered to be at least 160°. This is compatible with the belt-length assumption and with currently used sheave diameters.

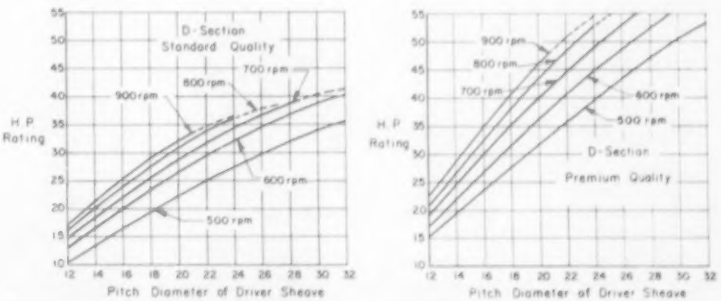
The curves given in Figs. 1 and 2 were developed from the above assumptions and fatigue-life equations for "D" cross-section industrial V-belts of standard and premium quality. The several sets of curves are shown simply to simplify their use. There is no difference either in the equations or the assumptions involved in the preparations of the curves.

The r.p.m. and diameters for which the curve is shown as a solid line corresponds to belt speeds below 5,000 ft. per minute. The dashed portion of each curve covers diameters for which, at the indicated r.p.m., the belt speed will range from 5,000 to 6,000 ft. per minute. The ratings for this dashed portion are as valid as the ratings for the solid curve, but some consideration should be given to the dynamic balance of the sheaves.

By "standard" quality belts we refer to the present version of the industrial V-belts which have been in general use since the early 1930's. Since World War II there have been improvements which now allow the standard belts to be rated at 10 per cent and 15 per cent higher levels than before. These resulting increases in ratings have been taken into consideration in preparing the curves.

In addition, the industry has developed another group of V-belts with even better fatigue-life characteristics. These premium-quality belts are able to transmit approximately 40 per cent more power than standard-quality belts for equal belt life. Since each type of belt has its own fatigue curve, the actual ratio between the rating for a premium and that for a standard-quality belt will vary from diameter to diameter, and from r.p.m. to r.p.m.

Ratings presented here, in some respects, simply represent an updating of V-belt ratings to current application practice. For example, on a 21-in. pitch diameter sheave at 900 r.p.m., a standard-quality "D" cross-section belt in rated at 33.5 hp. A commonly used slush-pump drive consists of 20 D-480 belts on this diameter and r.p.m. For a D-480, the rating is multiplied by 1.1, as indicated in the table below the ratings. This gives a total rating of 737 hp. for the drive which is quite often used with a pump having a maximum rating of about 700 b.hp.



THESE CURVES are for 330-in. belts, and are good from number 240 to 419 belts. For 420 to 599 belts, multiply by 1.1; for 600 and over belts, multiply by 1.2.

Author is with Gates Rubber Co., Denver. From a paper presented at petroleum-mechanical conference of A.S.M.E., September 19, 1954.

How to Design In-Tank Jet Mixing Systems—6

HERE is a calculation sheet, used in designing in-tank jet mixers for general mixing problems:

Known or assumed:

1. Blending-tank capacity, bbl.	33,000
2. Blending-tank liquid level, ft.	48
3. Blending-tank diameter, ft.	70
4. Circulating pump—rated capacity, g.p.m.	400
5. Circulating pump—rated head, ft.	250
6. Specific gravity—tank contents, 22° A.P.I.	0.9218
7. Specific gravity—incoming stream, 18° A.P.I.	0.9465
8. Desired blending time, hours	4
9. Pipeline friction losses:	
Suction line, ft.	48
Discharge line, ft.	52
10. Static heads on pump:	
Suction, ft.	48
Discharge, ft.	48
A. Use Fig. 3, knowing 2 and 3, find:	
11. Nozzle inclination angle, degrees	45
B. Select height of Nozzle from bottom, approximately 2 ft.	
12. Height of nozzle, ft.	2
C. Subtract height of nozzle from blending-tank level	
13. Nozzle submersion, 2 — 12, ft.	46
D. Use Fig. 9, knowing 6 and 7. Determine specific-gravity ratio $(p_2-p_1)/p_2$ where p_2 is 7, specific gravity of the incoming stream, and p_1 is 6, the specific gravity of the tank contents:	
14. Specific-gravity ratio	0.026
E. Use Fig. 10, knowing 14, 13, and 11, find:	
15. Minimum head to prevent stratification, ft.	35
F. Add for rated pump flow: from 5, 9, and 10:	
(a) Pipe loss—pump suction line, ft.	48
(b) Pipe loss—pump discharge line, ft.	52
(c) Static head at pump discharge, ft.	48
(d) Total head used (a plus b plus c), ft.	148
(e) Static head at pump suction, ft.	48
(f) Rated pump head, ft.	250
(g) Total head available (e plus f), ft.	298
Less, ft.	148
16. Net excess head* (g minus d), ft.	150
G. Use Fig. 6, knowing 4, 3, and 16, find:	
17. Calculated mixing time	1 hour, 15 minutes
H. Find actual total circulating time (start of blend to end of circulation)	
Case 1: If desired blending time is less than one-half calculated mixing time:	
18. Actual total circulating time = calculated mixing time, 17	—hours, — minutes
Case 2: If desired blending time is greater than one-half calculated mixing time:	
18. Actual total circulating time = blending time, 8, plus one-half calculated mixing time, 17	4 hours, 38 minutes
I. Use Fig. 7, knowing 16 and 4, find:	
19. Nozzle diameter, in.	1.3
J. Use Fig. 8, knowing 4 and 19, find:	
20. Nozzle thrust, lb.	120

*This MUST be greater than 15.

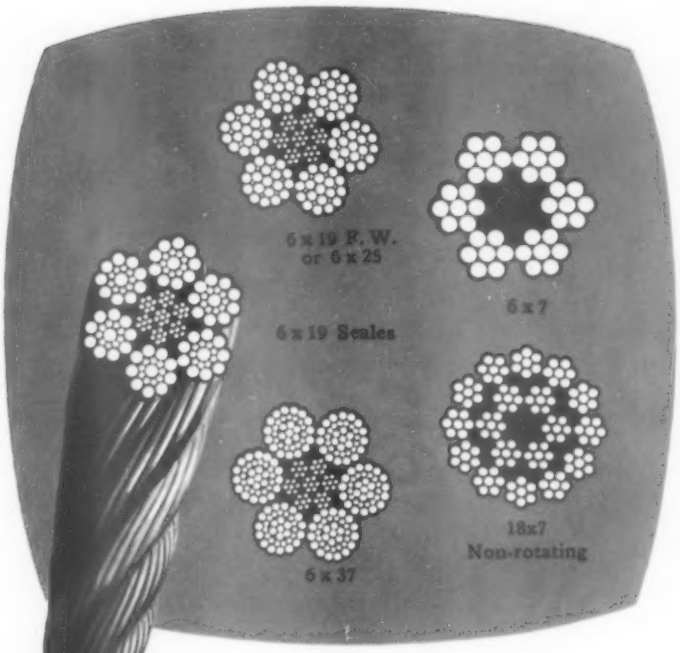
This material from E. I. du Pont de Nemours & Co., Inc.

Calculation Sheet for Mixing TEL With Gasoline

Known or assumed:

1. Blending-tank capacity, bbl.	5,000
2. Blending-tank liquid level, ft.	30
3. Blending-tank diameter, ft.	35
4. Circulating pump—rated capacity, g.p.m.	250
5. Circulating pump—rated head, ft.	100
6. Desired TEL addition time, hours	1
7. Pipeline friction losses:	
Suction line, ft.	4.3
Discharge line, ft.	33.8
8. Static heads on pump:	
Suction, ft.	30
Discharge, ft.	30
A. Use Fig. 3, knowing 2 and 3, find:	
9. Nozzle inclination angle, degrees	50
B. Select height of nozzle from bottom, approximately 2 ft.	
10. Height of nozzle, ft.	2
C. Subtract height of nozzle from blending tank liquid level:	
11. Nozzle submersion: 2 — 10, ft.	28
D. Use Fig. 4, knowing 1, 6, and 4, find:	
12. Lead concentration in circulating stream, cc. per gal.	40
E. Use Fig. 5, knowing 12, 11, and 9, find:	
13. Minimum head to prevent stratification, ft.	17
F. For rated pump flow: from 5, 7, and 8:	
(a) Static head pump suction, ft.	30
(b) Pipe loss; pump suction line, ft.	4.3
(c) Head available; pump suction (a minus b), ft.	25.7
(d) Pump rated head, ft.	100
(e) Head available; pump discharge (c plus d), ft.	125.7
(g) Static head; pump and eductor discharge, ft.	30
(h) Head available for pipe loss and nozzle (e minus g), ft.	95.7

(Calculation sheet continued in next installment)



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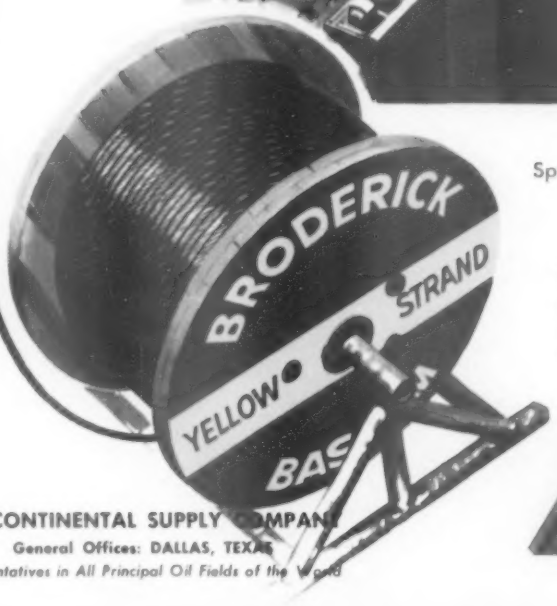

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

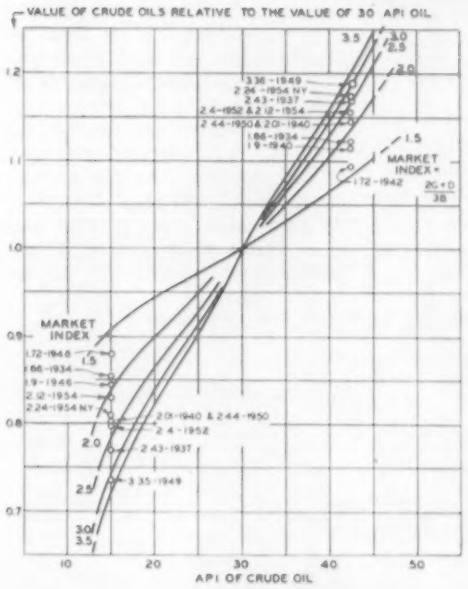

Fig. 1—Relation of values of crude oils of various gravities to the value of 30° A.P.I. oil—Gulf Coast product prices (except as noted).

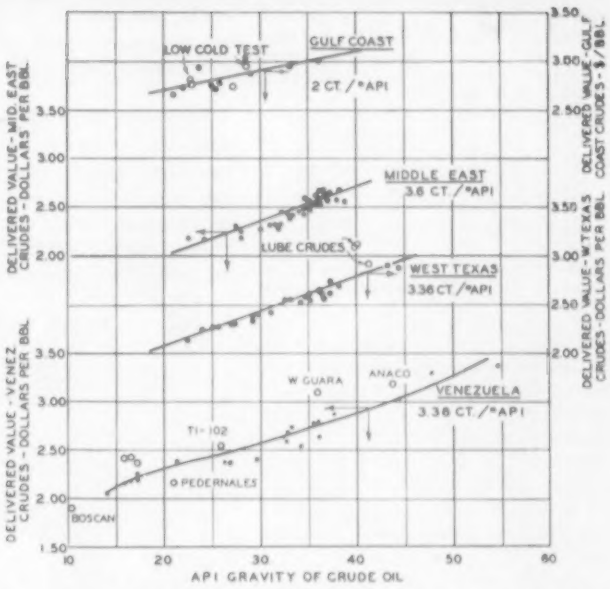

Fig. 2—Crude-oil value vs. gravity for various types of crude oils. Gulf Coast cargo product prices, June 23, 1954.

How to Estimate Value of Crude

"We can set down the value of our crude oil in terms of our products but how can we compare this value with that of other refiners or the general situation?" F. P. D. S.

So many factors affect the value of a crude oil that scarcely anything has been developed or published regarding the general situation. However, a fairly good representation of the many situations or market structures that arise can be had from what the author defines as the "market index." The market index consists of two times the price ($/bbl.) of regular gasoline, plus the price of No. 2 distillate divided by the price of Bunker C fuel oil:

$$\text{M. I.} = \frac{2\,G + D}{3\,B}$$

Being a ratio, the market index allows comparisons at various price levels and can therefore be used over a period of many years. Fig. 1 indicates the relative values of crude oils since 1934 as a function of market index and the value of 30° A.P.I. crude oil. The relationship is not perfect but it seems to include the effects of the major factors.

The points shown on Fig. 1 are based on more than 284 crude-oil realizations (product value less operating costs) computed in several different ways (which perhaps accounts for some of the inconsistencies). Some of the crude value vs. A.P.I. gravity curves are in Fig. 2.

In using Fig. 1, the market index (M. I.) is computed from current price quotations. A curve of crude-oil value relative to the value of 30° A.P.I. oil can then be drawn from Fig. 1. In order to establish actual dollar values, it is then necessary to compute a crude-oil realization (or two as a check) using preferably a crude oil whose gravity is close to 30° A.P.I.

Evaluating Crude for Diesel Fuel

"In your book on 'Venezuelan and Other World Crude Oils' you give diesel fuel yields for a boiling range of 400°-700° F. Our 400°-700° F. diesel fuel has too high a pour point, so how much need we lose in order to obtain a marketable diesel fuel?"—S.G.F.

Pour point is such an elusive property that an exact answer cannot be given but some indications can be had from "Effect of Boiling Range on the Pour Point of Diesel Fuels or Distillates" and "Effect of Mid-Boiling Point on Diesel Index," both of which appeared on this page (The Oil and Gas Journal, June 28, 1954, page 132, and July 12, 1954, page 118). The reason the wide boiling range of 400°-700° F. is used extensively is that this full range of diesel fuel can be produced from only a few select crude oils. Such crude oils can be considered as perfect from the standpoint of diesel-fuel production whereas other crude oils are inferior because it is necessary to produce a shorter boiling range of diesel fuel if the pour point is to be low enough (or if the diesel index is to be high enough). Stocks of high diesel index usually have too high pour points and vice versa.

Although difficulties arise in predicting the pour point of a particular stock, the relationship between the pour points of stocks all of which

TABLE 1
Approximate Boiling Ranges of Straightrun Diesel Fuels That Have a Pour Point of Zero and a Diesel Index Exceeding 50

Characterization factor	Approximate mid-b.p.*	Boiling range (°F.)	Yield relative to full yield from 400° to 700° F.
12.2	440	400-480	27
12.0	490	400-580	60
11.9	515	400-630	71
11.8	535	400-670	90
11.7	540	400-680	93
11.6	550	400-700	100
11.65	440	400-480	27
11.5	under 400	none	zero

*Required to reduce pour point to zero down to 11.6 C.F., thereafter to raise diesel index.

are derived from the same crude oil as shown in Fig. 1, are quite consistent. Even at the extremes of midboiling point (420° or 800° F.) the accuracy of Fig. 1 is within plus or minus 20° F. Fig. 1 was based on the two articles mentioned above and an earlier discussion (Effect of Boiling Point on Diesel Index, September 15, 1952, page 141).

A 400°-700° F. straightrun fuel of 11.6-11.65 characterization factor usually has a pour point of about zero and a diesel index of about 50. Materials of lower characterization factor have too low diesel indexes whereas materials of higher characterization factor have too high pour points. In both cases part of the high-boiling material in the fuel must be eliminated if the resulting fuel is to have a pour point of zero and a diesel index of 50 or higher. This general relationship is indicated in Table 1. It is a compromise between two widely divergent sources of information as discussed in Questions on Technology, The Oil and Gas Journal, September 15, 1952, page 141, and June 28, 1954, page 132.

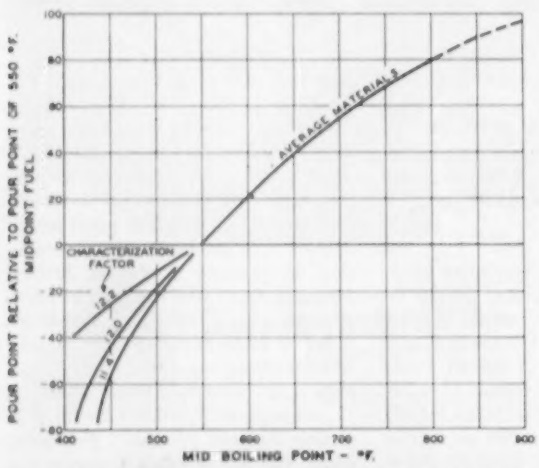

Fig. 1—Effect of midboiling point on the pour point of straightrun distillate materials.

Viscosity of Various Crude Oils

"We are handling some heavy crude oils and we wonder if they are more viscous than other oils. Can you supply information?"—W.P.G.

There are wide variations in the viscosities of crude oils but these variations appear among oils from any area. The oils in question can be compared with the many oils shown in Fig. 1. In general, the typical coastal oils have lower viscosities than the average, and Mississippi oils appear to have higher viscosities. Venezuelan crude oils are about the same as other oils except that they may be somewhat less viscous in the lower ranges of A.P.I. gravity.

Table 1 shows the average viscosity of crude oils in several units of viscosity. The viscosities for temperatures of 150°, 210°, and 122° F. were taken from a chart (not shown here) which results in generally high or conservative viscosities.

TABLE 1—AVERAGE VISCOSITY OF CRUDE OILS

°A.P.I. gravity	Viscosity, S.s.U. at 100° F.	Viscosity, S.s.U. at 150° F. approx.	Viscosity, S.s.U. at 210° F. approx.	Kinematic, cs. at 100° F.	Cp. at 100° F.	Purol at 122° F. approx.	Venezuela S.s.U. at 100° F.
10	.....	.....	.....	.....	.....	.....	45,000
11	.....	.....	.....	.....	.....	.....	22,000
12	28,000	2,800	440	6,060	5,950	950	11,000
13	12,000	1,500	285	2,600	2,540	420	6,200
14	6,200	950	210	1,340	1,305	250	3,600
15	3,300	600	150	715	690	135	2,300
16	2,000	410	119	435	418	78	1,500
17	1,270	300	98	275	262	61	1,000
18	880	230	84	190	180	46	700
19	590	170	72	128	120.3	32	480
20	410	133	63	88	82	24	350
21	290	103	55	62.5	58	.....	280
22	210	86	50.5	45.5	42	.....	230
23	160	73	47.5	34.5	31.6	.....	190
24	130	65	45	27.5	25	.....	160
25	106	58.5	42.6	22.0	20	.....	138
26	90	53.5	40.8	18.3	16.4	.....	119
27	80	50.5	39.5	15.7	14	.....	100
28	72	49.5	38.5	13.7	12.1	.....	87
30	62	44.5	37	10.9	9.6	.....	67
32	56	42.5	36.2	9.2	8	.....	53
34	50.5	40.5	35.3	7.5	6.4	.....	44
36	46	38.5	34.5	6.2	5.25	.....	39

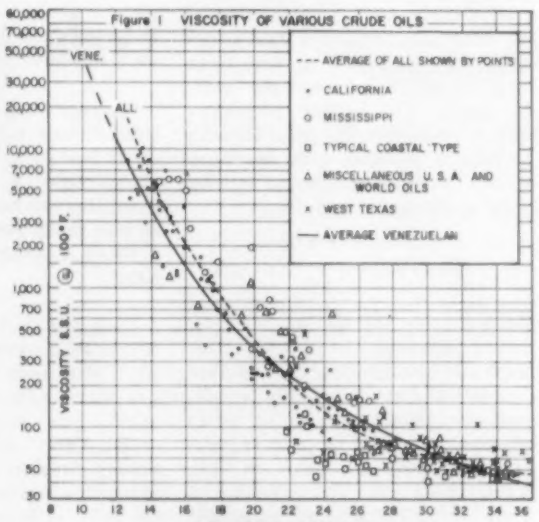

Fig. 1—Viscosity of various crude oils.

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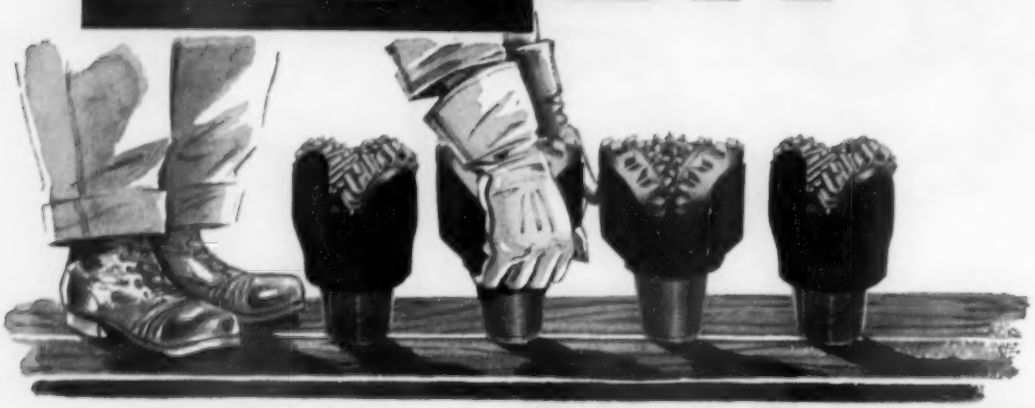

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Soso's Lower Cretaceous production, in the Glen Rose-Rodessa section, was opened in August 1953. Its development since then, extending into three counties, has resulted in completion of 15 wells, including 10 by Gulf Refining Co., 2 each by Humble Oil & Refining Co. and Union Producing Co., and 1 by Vaughey & Vaughey.

Productive sands are encountered at depths of 11,500 to 12,000 ft. with wells being drilled to total depths around 12,500 ft.

Contractors in the field, companies for which they are drilling, and rigs running for each are shown in the following tabulation:

	Gulf	Union	Humble	Total Rigs
Cook Drilling Co.	1			1
Rex Drilling Co.	1			1
Arrow Drilling Co.		1		1
Crescent Drilling Co.	1	2		3
Marshall Young	1	1		2
Crawford Drilling Co.	1			1
Penrod Drilling Co.	*2			2
Dixilyn Drilling Co.	1			1
Dorris Ballew, Inc.		1	1	2
Total	8	5	1	14

*Includes 1 workover rig.

Creighton Drilling Co., Tulsa, is drilling on a 5,700-ft. wildcat test southwest of Centerpoint field, in Pottawatomie County, Oklahoma. It is a contract job for Johnson & Gill at 1 Hubbard. Spot location is in 23-9n-2e.

Edwards & Bissett Drilling Co., Houston, is drilling for W. S. Boyle and associates at 1 Newport, a Yegua exploratory test in the Singer area, 1½ miles southwest of Juanita, in Beauregard Parish, southern Louisiana.

Brown Drilling Co., Long Beach, Calif., is under contract for a 5,500-ft. wildcat test to be drilled for Monterey Oil Co. in the North Sacramento area, in Sacramento County, California. Location is for 1 Humble-Wright, in 9-9n-4e.

Coulston Drilling Co., Gladewater, Tex., has a new wildcat operation under way 1 mile east of Chandler, in Henderson County, East Texas. It is being drilled for Stroube & Stroube and L. A. Grelling at 1 Hardee, in the Simon Weiss Survey. Objective is around 5,000 ft.

New Tri-State Company

D-T Drilling Co. is a newly formed contracting firm working in the tri-state area of Illinois, Indiana, and western Kentucky. Principal owner is D. C. Thompson, headquartering at Grayville, Ill. The firm is starting with one rotary rig.

Delta Gulf Drilling Co., Tyler, Tex., has the contract on Humble Oil & Refining Co.'s new wildcat test in the Harahan area, Jefferson Parish, Louisiana. The location, 1 Lauricella, in 40-13s-10e, is on the north bank of the Mississippi River, just west of New Orleans, and about 2½ miles north of production at Avondale. Hole is projected to 9,800 ft.

Cardinal Drilling Co., Casper, Wyo., has moved a rig to a rank wildcat location 8 miles northeast of Linton, in Emmons County, South Central North Dakota, where it is under contract for a 4,200-ft. Devonian test for Mobil Producing Co. The test is F-22-30-P, in 30-134n-75w.

Holbert Drilling Co. is contractor on a 4,000-ft. wildcat test John B. Coffee, of Houston, is putting down at 1 Adams, in the Mathew Boren Survey, 2 miles east of Currie, in Navarro County, East Texas.

R. H. Norris, cable-tool contractor, Glasgow, Ky., is moving in a string of tools for a 2,500-ft. Knox dolomite test he will put down for Edward T. Merry, independent operator, Spring Hill, Ala., in southern Colbert County, northwestern Alabama. Location of the test, carried as 1 Thomas, is about 6 miles northwest of Frankfort, in northern Franklin County. The rig has been operating on contract in the latter county.

Brazell & Wrather Drilling Co. is starting work on a deep wildcat test in the Powell area of northern Converse County, Wyoming. The test, 1-B Dow-Union, is being contracted for Sapphire American Petroleums and I. Pas-

STOP LEAKS

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ternack, and is expected to be carried to around 11,000 ft. Location is in 29-40n-73w. It is about 45 miles northeast of Casper in the Powder River basin.

Wagner-Wyant Drilling Co., Amarillo, Tex., has a new wildcat operation under way for J. J. Lynn, of Abiline, Tex., in southwestern Cimarron County, Oklahoma Panhandle. Location is at 1 Brooks, in 14-1n-4eCM, about 3½ miles north of the Texas line. Hole will be carried to granite around 6,000 ft.

Rocky Mountain Drilling Co., Los Angeles, has contracted for a deep test to be drilled for Porter Sesnon and associates in the Ciervo Anticline area, 35 miles northwest of Coalinga, in San Benito County, northern California. Drilling is expected to be carried to 12,000 ft. Location is in 14-16-11.

Frank Frawley Drilling Co., Tulsa, is keeping a rig working for Sunray Oil Corp. in the new gas-distillate area, in Eunice-Monument field, Lea County, New Mexico. Now drilling is 10 Alaska-Cooper, a 5,750-ft. test southeast of the new gas-distillate area. Location is in 7-20-37.

Carnes W. Weaver Drilling Co., Houston, has a new wildcat operation under way 3½ miles east of Rosharon, in northwestern Brazoria County, Texas. It is a contract job for C. W. Vick at 1 Texas Gulf Producing Co. Location is in section 35, H&TB Survey. Hole is projected to 7,800 ft.

Terminal Drilling Co., Los Angeles, is contractor on an exploratory test Bandini Petroleum Corp. is putting down at a wildcat location south of Torrance field, in Los Angeles County, southern California. Designation of the test is 1 Chandler-Fort Bend. Location is in 35-4s-14w.

Harrell Drilling Co., Houston, is drilling on a new contract it has with Kirby Petroleum Co., also of Houston, for an 8,500-ft. test in the Edna area, Jefferson Davis Parish, Coastal Louisiana. The test, listed as 1 Powell, is about 2,000 ft. south of Ada Oil Co.'s short-lived prospective discovery well, 1 Powell, reported last week as being temporarily abandoned.

Continental Drilling Co., Houston, is under contract to Gulf Refining Co. for an 8,000-ft. semi-wildcat test in the West Delta Block 52-Southeast West Bay area, in the Mississippi River delta, Plaquemines Parish, Louisiana. Designation of the test is 3-C Harvey, with location in 29-23s-31e.

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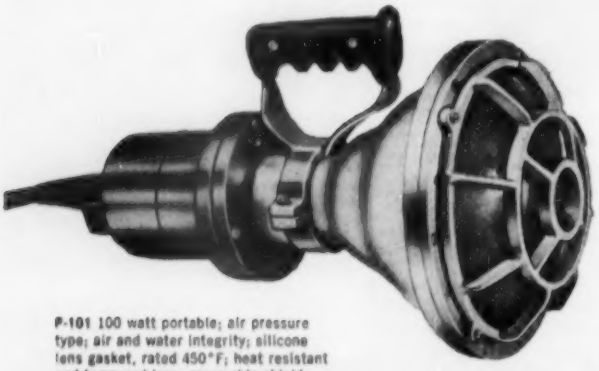

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REFINING

Lion to Add Unit

Expansion at Barton plant made known at dedication

LULING, La.—The announcement of an expansion program for an ammonia plant which has just begun operations indicates that the rapid growth of nitrogen fertilizers in the past few years has not yet stopped.

Col. T. H. Barton, chairman of the board of Lion Oil Co., announced at the dedication of Lion's new petrochemical plant here that the plant would shortly be enlarged by the construction of a unit to manufacture nitrogen fertilizer solutions.

The plant is located on a 1,400-acre plot on the west bank of the Mississippi River, 14 miles upstream from New Orleans.

The Barton plant manufactures nitrogenous chemicals for agriculture and industry, using natural gas, air and water as raw materials. It has capacity for the daily production of approximately 300 tons of anhydrous ammonia, a large portion of which is processed into pelleted ammonium nitrate for use as fertilizer.

Waste carbon dioxide from the ammonia manufacturing process is utilized at the plant in the manufacture of about 42 tons per day of solid and liquid carbon dioxide.

Manufacturing operations at the plant were begun late in May of this year. About 18 months were required for construction of the installation. Chemical Construction Corp., New York, was the engineer-architect, and Lummus Co. was the prime construction contractor.

Tears Awarded Contract

STERLINGTON, La.—Tears Engineers, Dallas, will design and provide all the equipment for the separation and purification section of Commercial Solvents Corp.'s nitroparaffin plant being built here.

Tears has already begun work on its share of the project, and the plant is expected to be on stream in August 1955.

Pipeline, Storage Finished

NEW YORK.—A new high-capacity refinery pipeline system and seasonal storage project has been completed by Esso Standard Oil Co. at Linden, N. J. Final white coats of paint are now going on the last of 18 150,000-bbl. tanks at the Rahway River tank field 4 miles from the Bayway refinery.

A pipeline network comprising thousands of feet of small lines tying into

W.P.R.A. Panel Holds Question-and-Answer Session

Western Petroleum Refiners Association recently held a day-long question-and-answer session on refinery operations at El Dorado, Ark. E. A. Heike (standing), Premier Oil Refining Co., Fort Worth, was the panel moderator. Other panel members are (left to right): F. D. Parker, Blaw-Knox Co., Tulsa; J. G. Eckhouse, Universal Oil Products Co., Des Plaines, Ill.; D. E. Norris, Houdry Process Corp., Philadelphia; Dr. C. W. Rippie, Electric Process Co., Summit, N. J.; Heike; J. M. Brown, Pan-Am Southern Corp., El Dorado; R. E. Feasel, Deep Rock Oil Corp., Cushing, Okla.; J. A. Gearhart, American Liberty Oil Co., Mount Pleasant, Tex.; and R. S. Wilson, Lion Oil Co., El Dorado. E. A. Edwards, Phillips Petroleum Co., Bartlesville, Okla., a member of the panel, was not present for the photo.

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a 2½-mile stretch of 30-in. line, provides a movement of 20,000 bbl. per hour between the refinery and the tank farm.

At the plant, the new intra-refinery pipeline system can be controlled from a centralized house permitting rapid loading or unloading by use of a push-button instrument panel. The project also includes a 5,000-bbl. commingled products tank, pumpout pumps, and four product shipping pumps. The new tank field will handle both heating oil and gasoline.

The project, exclusive of tanks, was constructed by the Kuljian Corp. which handled all design, engineering, and procurement.

Sohio Unit Completed

CLEVELAND.—Standard Oil Co. (Ohio) has placed a 12,000-bbl. per day Platforming unit on stream at the Lima refinery. The $7½ million unit replaces an old thermal reforming unit. Hydrogen from the new unit will provide a portion of the feed for a new 300-ton per day ammonia plant to be built at Lima.

Reformate from the new Platformer will be blended to Sohio's new "Boron Supreme" motor fuel, which contains aviation antiknock fluid.

A.P.I. Manual Available

NEW YORK.—The American Petroleum Institute has announced publication of a new standard of "Measuring, Sampling and Testing of Crude Oil and Petroleum Products," to be known as Standard 2500. It will replace in part, A.P.I. Code 25, and will consist of two sections on automatic temperature devices and automatic gaging devices.

This marks the first inclusion of automatic equipment in an A.P.I. standard. Calibration of containers will be covered in Standard 2501 to appear later. The new Standard 2500 is available from the New York or Dallas A.P.I. offices at $1.00 a copy in either the 8 by 10½ in., or the 3¾ by 6¼ in. sizes.

Alkylation Pipeline Let

NEW YORK CITY.—The Texas Co. has contracted with Catalytic Construction Co. to install 23 miles of off-site piping necessary to tie in an alkylation plant which the contractor is now completing at Texaco's Eagle Point, N. J., refinery.

A contract for construction of a new olefin feed-preparation-splitter unit has also been signed for Eagle Point.

See Composite and Refinery Catalogs, or Write for Folder On

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This booklet is the latest in a series of technical publications issued by Johns-Manville under the collective title "The Gasket." It is based on studies made at the Johns-Manville Research Center, largest laboratory of its kind in the world. It incorporates the long experience of Johns-Manville engineers in the design of gaskets such as asbestos, fibre and composition types, asbestos-metallic and all-metal gaskets.

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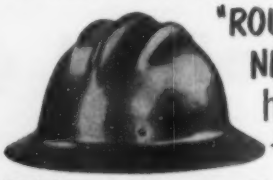
Only metal safety cap manufactured. Flared brim protects ears and neck, but does not interfere with carrying or working in close quarters.



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Weighs only 12 ounces. Universal headband can be adjusted to any standard size in two minutes.

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TRUCK INTERIOR is compactly designed to include all necessary equipment yet give the gager room to work. See sketch below.

TRUCK ROOF has a vent that clears crude-oil fumes from the interior. Identification markings on roof are for patrol pilot.

Gagers get laboratory and office on wheels

MAKING "grindouts" at the back of a car during bad weather will soon be a thing of the past for gagers of Service Pipe Line Co. Instead, they will be using custom-finished panel trucks which are equipped with everything a gager might need.

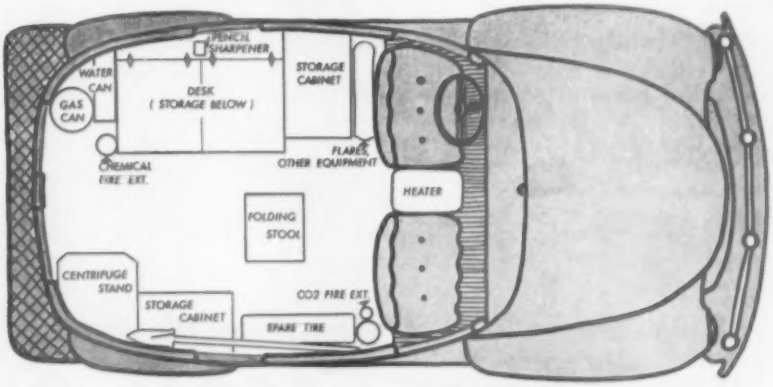
The trucks are standard models which are modified in Service's Tulsa shops. The modification includes installation of metal desks, storage cabinets, toolboxes, overhead compartment lights, panel windows, ceiling vents, extra heaters, centrifuges, etc.

Primarily, the switch to panel trucks from business coupes was made to give the gager more room for work, a place to perform paper work during his runs, and to give him protection from the weather during winter months.

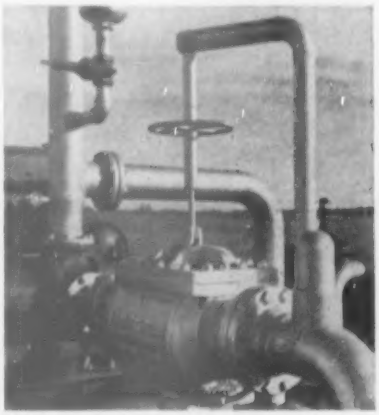
Those trucks which will see service in the northern part of the country will be equipped with an extra 50,000 B.t.u. gasoline heater. More accurate and more efficient gaging is sure to result from the gager being warmer and more comfortable.

Before settling on a design, Service put several trucks in the field on a trial basis and asked gagers to make written reports on performance and offer suggestions for improvement. Acceptance in general was quite enthusiastic but several changes were requested by field personnel. These included installation of side windows, anchoring of loose articles to prevent rattling, placement of spare tire inside the panel, and others.

A standardization design evolved from the many suggestions and the resulting vehicle is a combination laboratory and gager's office. By the end of next year Service expects to furnish all of its 150 district gagers with these vehicles. *(Reprinted from The Connecting Rod.)*



FLOOR PLAN of the truck interior puts all equipment in its logical place for easy access to the gager.



No strain in this strainer changing

THE changing of strainer baskets at this pipeline pump station, located in Dollarhide field of West Texas, is simplified with an arrangement to lift the strainer lid. The cantilever pipe bracket supports a handwheel assembly which is threaded onto a shaft fastened to the lid of the strainer housing.

With the installation, one man can service the unit with a minimum of effort. All he has to do is remove the stud-bolt nuts, turn the handwheel to

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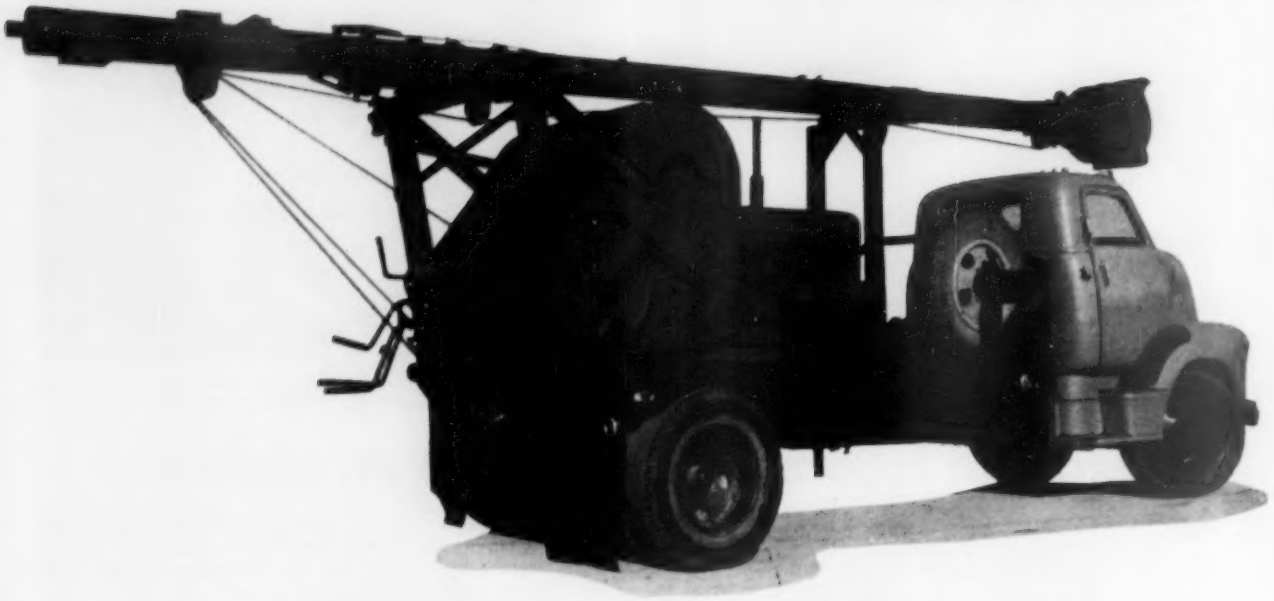

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lift the lid, and swing the entire assembly clear of the housing by turning the 4-in. pipe which is pivoted at its base.

LEVEL AND TEMPERATURE gaging is combined in this remote-reading tank gage installed at the Paulsboro terminal of Esso Standard Oil Co.

New tank gager does dual job

A NEW gage system which combines level gaging and temperature measurements in one operation promises to give better accuracies in the gaging of petroleum products.

DUAL-PURPOSE gage has electronic control box, 4-in. pipe for level gage plus conduit for temperature indicator.

The gage measures liquid depth by means of electronics and is designed for maintained accuracy of ⅛ in., plus or minus. It uses no float or sonic mechanism but is actuated by signals from a metal probe which touches the liquid surface. A servomotor responds to these signals and raises or lowers the sensing probe to keep it immersed a given distance as the liquid level changes. Thus, one disadvantage is overcome in that change in gravity of the gaged liquid has no bearing on accuracy of the gage.

An important adjunct to the level-gage system is the provision for incorporation of a remote-reading, average-resistance thermometer. If the resistance-thermometer system is installed with the gage system, a cam-operated device which is geared to the gage is provided to select automatically the proper resistance element corresponding to the liquid level. The receiver for the temperature gage may be included with that of the level gage, making it possible for the resistor elements of a given tank to be energized when that tank is selected for level gaging. Thus, level and temperature information is available in one instrument.

Components . . . Besides the remote receiver and associated field wiring, each tank gage consists of a sensing device suspended within the tank from a perforated steel tape, a two-phase motor,

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PIPELINE PATROL

a radio-frequency oscillator and receiver, and a shielded cable connecting the electronic equipment with the sensing probe. This cable parallels the steel tape and moves with the tape as the level changes.

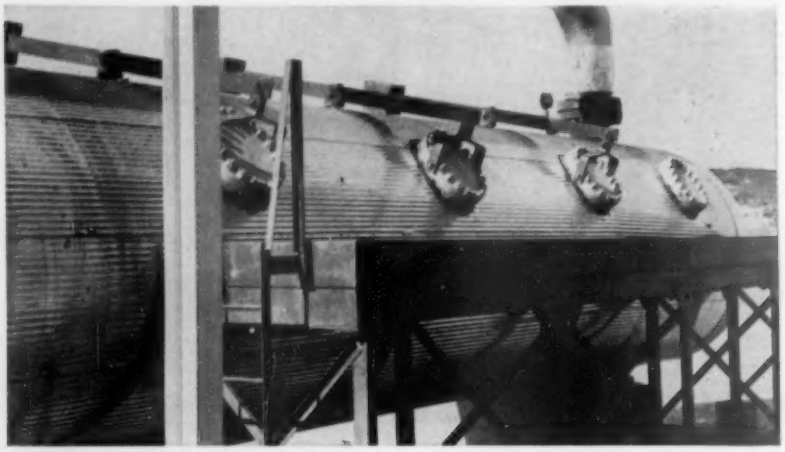
In operation the oscillator sends signals through the sensing element and back to the receiver. The signal strength at the receiver varies in accordance with depth of immersion of the sensing probe, with the signal becoming weaker as the depth increases and stronger as it decreases. The output voltage of the receiver varies with the signal strength from the sensing probe. This voltage is applied to one phase of the servomotor which drives the tape and probe. A constant voltage is applied to the other phase as a reference.

The circuit is designed so the amplifier voltage will just balance the line voltage when the sensing element is projecting ⅛ in. into the liquid. Since the amplifier voltage is variable according to probe immersion, the higher or lower voltage opposing the constant line voltage will cause the servomotor to rotate in either a clockwise or counter-clockwise direction. This turns a sprocket which drives the perforated tape and raises or lowers the sensing probe in accordance with the liquid level.

The motor also drives and positions wiper arms on the high-resistance potentiometers which are used to transmit level signals to the remote receiver.

Remote receiver . . . The remote-reading receiver uses two servomotors for positioning of the level-indicator scales. Actuating signals for the motors are derived from a null-balance circuit.

The level gage is manufactured by Gilbert & Barker Mfg. Co. of West Springfield, Mass., and the temperature device which may be used in conjunction with it is manufactured by Weston Electrical Instrument Corp. of Newark, N. J.



Maintenance hints . . .

Recharging this 40,000-M.c.f.d. dehydrator of the Permian Basin Pipe Line Co. became a one-man operation with the addition of counterbalancing weights to lift the flanges. The unit is located in Puckett field, Pecos County, Texas.

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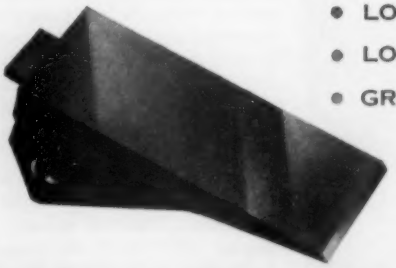

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SPECIALIZED EQUIPMENT FOR THE PIPELINE INDUSTRY

~~MILLS PLASTIC~~ BUTYRATE III does jobs metal pipe can't do. Often cuts installation costs 50% and more

Mills Plastic III pipe weighs only about 1/10 as much as metal pipe of the same diameter, yet it takes on the toughest jobs. It speeds installations amazingly because it can be cut with an ordinary hand saw, and can be quickly joined with Milex fittings and Mills Plastic III Solvent. (The simple technique is shown at right. Flange adapter unions are available to adapt from S.W.P. sizing to iron pipe thread where required. Ask your distributor for details, or write for new booklet describing all Continental Mills Plastic piping, tubing and fittings.

PETROLEUM — Here's the ideal pipe for refinery discharge, crude oil, sour crude, salt water and natural gas.

UTILITIES — Easily installed in corroded gas lines by push- or pull-through methods. Eliminates trenching and repaving.

INDUSTRY — Successful where corrosive liquids or mineral depositions damage other pipe. Smooth walls increase flow rate.

AGRICULTURE — Installing stock watering lines, sprinkler systems and irrigation lines becomes a one-man job with Mills Plastic III.

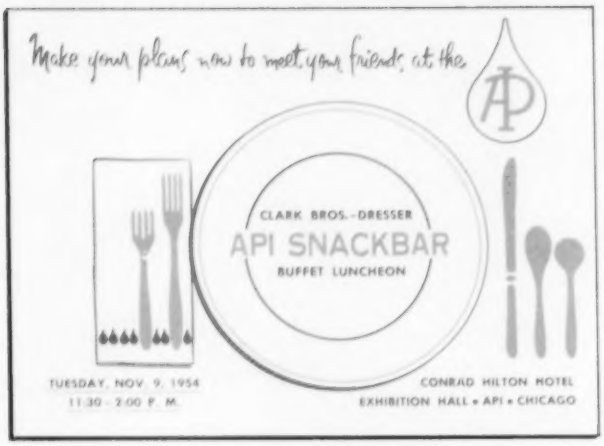
1. Wipe pipe end with Mills Plastic III Solvent.

2. Wipe inside of fitting with Mills Plastic III Thinner.

3. Insert the pipe end into the prepared slip fitting.

4. The job's done. Pipe can be handled in minutes!

CONTINENTAL CAN COMPANY
MILLS PLASTIC PIPE DIVISION
SALES OFFICE
100 EAST 42nd STREET, NEW YORK 17, NEW YORK
Factory: 2930 North Ashland Avenue, Chicago 13, Ill.



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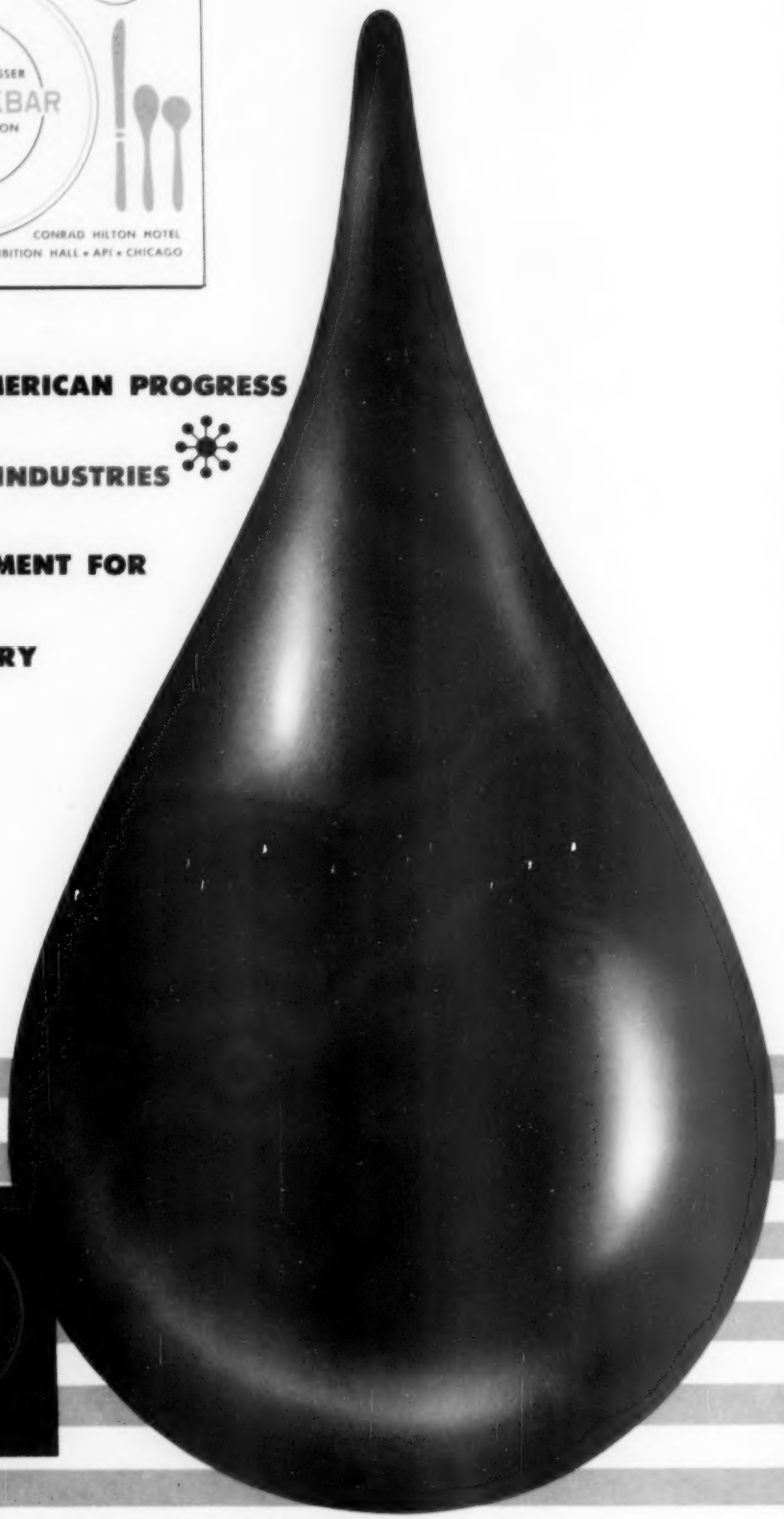
DRESSER INDUSTRIES

... BASIC EQUIPMENT FOR

THE OIL INDUSTRY



Greetings—

API

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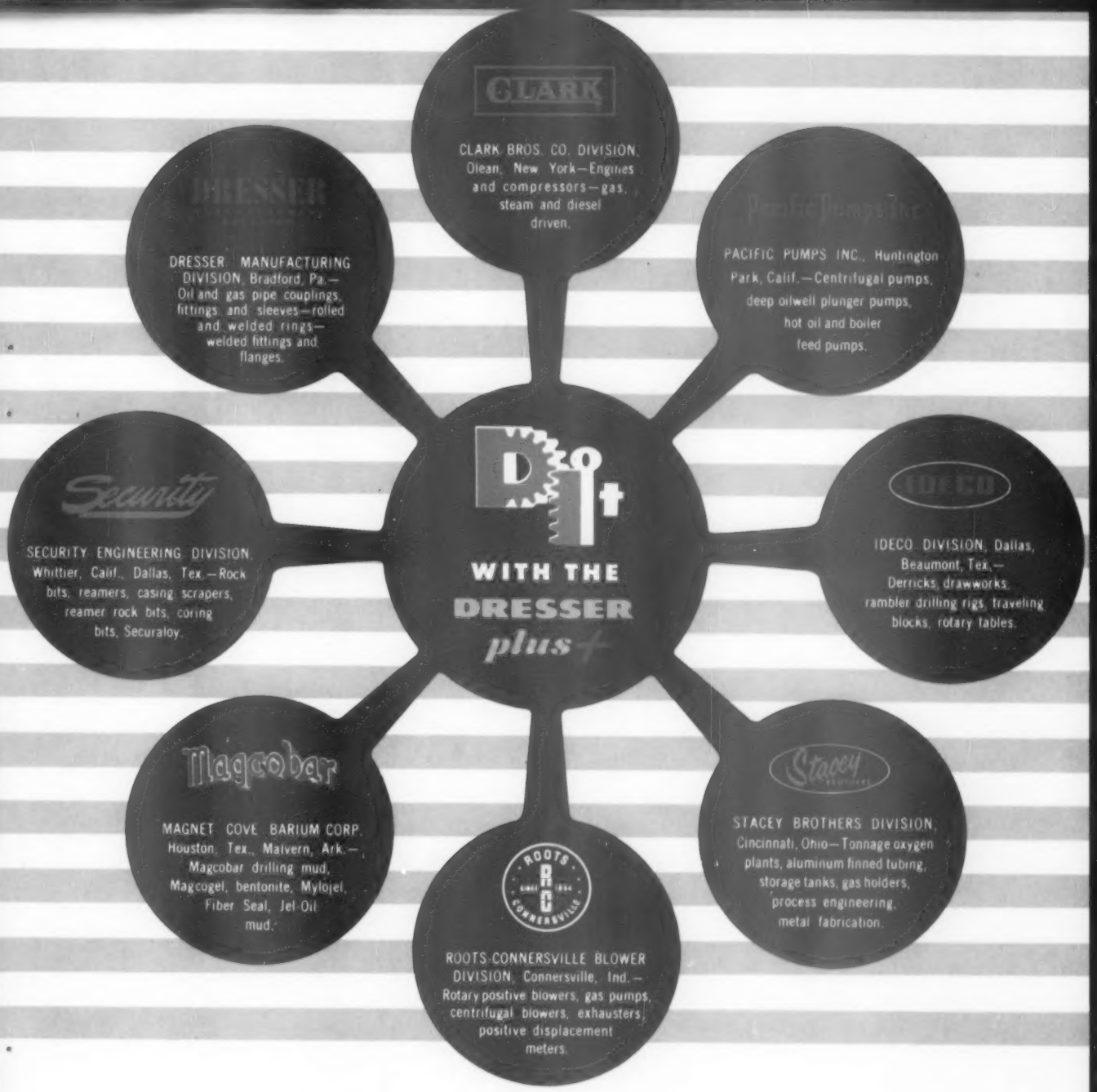
CLARK
CLARK BROS. CO. DIVISION, Olean, New York—Engines and compressors—gas, steam and diesel driven.
DRESSER
DRESSER MANUFACTURING DIVISION, Bradford, Pa.—Oil and gas pipe couplings, fittings and sleeves—rolled and welded rings—welded fittings and flanges.
Pacific Pumps
PACIFIC PUMPS INC., Huntington Park, Calif.—Centrifugal pumps, deep oilwell plunger pumps, hot oil and boiler feed pumps.
Security
SECURITY ENGINEERING DIVISION, Whittier, Calif., Dallas, Tex.—Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, Securaloy.
WITH THE DRESSER plus +
IDECO
IDECO DIVISION, Dallas, Beaumont, Tex.—Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables.
Magcobar
MAGNET COVE BARIUM CORP., Houston, Tex., Malvern, Ark.—Magcobar drilling mud, Magcogel, bentonite, Mylojel, Fiber Seal, Jel-Oil mud.
Stacey
STACEY BROTHERS DIVISION, Cincinnati, Ohio—Tonnage oxygen plants, aluminum finned tubing, storage tanks, gas holders, process engineering, metal fabrication.
ROOTS CONNERSVILLE
ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, positive displacement meters.

Use any Dresser product and put the DRESSER *plus* + to work for you!

Every day, petroleum plays an increasingly important part in providing the basic energy for this nation's unequalled industrial potential. And the companies that make up Dresser Industries continue to provide more and more of the basic equipment used by the great petroleum industry in the unfailing performance of its responsibilities as a public servant. In every phase of the oil industry – from drilling to distribution – the Dresser companies work together to supply these equipment needs.

When you use any Dresser product, you get an important added value . . . the DRESSER PLUS + . . . the coordinated research and combined engineering talent of all the Dresser companies directed toward one goal: to make certain that every Dresser product continues to be *a standard of comparison the world over.*

DRESSER INDUSTRIES, INC.
OIL, GAS AND CHEMICAL EQUIPMENT

ATLANTIC BUILDING • DALLAS, TEXAS

WE CHECKED THE RECORD and AGAIN CHOSE

GOODALL LONG-LIFE ROTARY HOSE

The kind of performance we promised for Goodall Long-Life Rotary Hose is now a matter of field record. Service actually rendered by this revolutionary rotary hose under practically every conceivable drilling condition has proved it to be the strongest ever built. It is also a matter of record that Long-Life is more durable, more flexible and perfectly balanced. And Barney Couplings . . . the only coupling made that is stronger than the hose itself . . . give Goodall Long-Life Rotary Hose the highest salvage value of any other hose on the market. Before you buy your next rotary hose look around the field. You'll find that the Goodall Long-Life design has eliminated the cause of more than 90% of rotary hose failures. And you pay no premium for this extra quality, longer life and higher salvage value. It costs no more than ordinary hose. So next time get the best. . . . specify Goodall Long-Life Rotary Hose.

GOODALL RUBBER COMPANY
TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Odessa, San Angelo, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul.
EXPORT: Goodall Rubber Company, Trenton, N. J.
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Want more information on products advertised in this issue? Or do you want to know more about the items described in the "New Equipment Section"? Or would you like some of the literature here mentioned?

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Just use the convenient prestamped cards on this page. We'll forward your requests promptly.

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To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of Nov. 8, 1954

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The cards shown here are supplied for your convenience. Just ✓ ✓ ✓ check the circle with the number of the item in which you are interested, tear off the card, and drop it in the mail.

We do the rest

If you want additional information on any product advertised in this issue, note the page number on the card.

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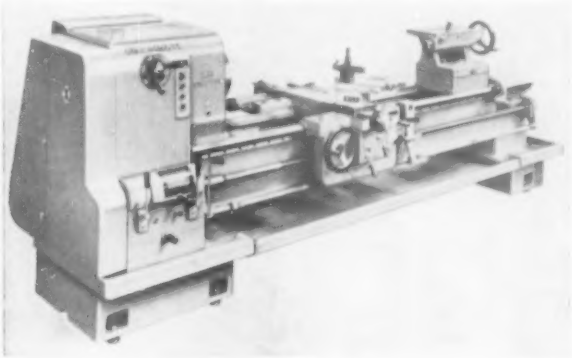
... What's New in Equipment?

Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller

Lathe Is Made for Refinery Use

An extra-large spindle hole for refinery and chemical-plant use is a feature of the new 21½ and 26-in. tray-top lathes. While the standard spindle supplied with the machine has a hole



larger than is usual, provision is made to supply on demand a spindle with a 2 7/16-in.-diameter hole.

The new lathes have 12 spindle speeds in geometric progression. The spindle, with long-taper-key drive nose, is rigidly mounted in three precision antifriction bearings. All headstock bearings are pressure-lubricated with filtered oil. Fifty-four thread and feed changes are made available through a totally enclosed, automatically lubricated quick-change gear box, where a lever to reverse the lead screw is also incorporated.

The apron is a one-piece, double-walled casting with automatic lubrication. Longitudinal and crossfeeds are engaged with drop levers operating positive jaw clutches, and a spindle start-stop control lever is supplied at the apron and quick-change box. The bedways are ground, and will be flame-hardened on demand.

A fully enclosed electrical panel provides a safe and accessible place for the power connections. A builtin disconnect switch guards against exposing a live panel. Power is transformed from 220 volt and over to provide only 110 volt at the operator's push buttons.

The lathes are offered with a 5 or 7½-hp. motor mounted on the rear of the headstock for easy maintenance. *Cincinnati Lathe & Tool Co.*

Check No. 1 On The Time-Saver Card

Detector Finds Holidays In Difficult Conditions

A new holiday detector, known as Model M-1, can locate holidays in thin films of relatively high electrical resistance when such films are applied to the surface of material of low electrical resistance, such as metal or concrete.

According to the manufacturer, the M-1 detector is a highly sensitive electrical device. It is provided with a bell signal to indicate the flaw, and has a dampened sponge for an exploring electrode. The detector unit is housed in a leather case with provision for attachment to the operator's belt.

The method of test is nondestructive and a potential of only 67½ volts is maintained between the electrode and the conductive surface. The instrument is completely portable, weighing less than 3 lb. It is approximately 3 by 4 by 6 in. in size. *Tinker & Rasor.*

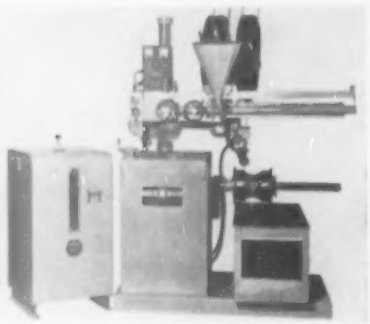
Check No. 2 On The Time-Saver Card

Rebuilding Machine Is Fast and Versatile

Faster efficient rebuilding of new and worn parts, automatically, is the job performed by the new Mir-O-Col K-2M automatic rebuilding machine. The new machine is versatile enough to handle practically any shape work.

Cylindrical pieces up to 40 in. in diameter can be locked onto the rotating shaft, or the entire boom can be swung around to the side for rebuilding on a stationary or rotating table.

Engineered for ease of operation, the K-2M incorporates a number of features to simplify adjustments of its moving parts. The work shaft, which can be tilted a full 90° for rebuilding flanged surfaces, is operated electrically. Raising and lowering of the welding boom is also controlled by a motor. A handwheel for fine vertical adjustments is also provided.

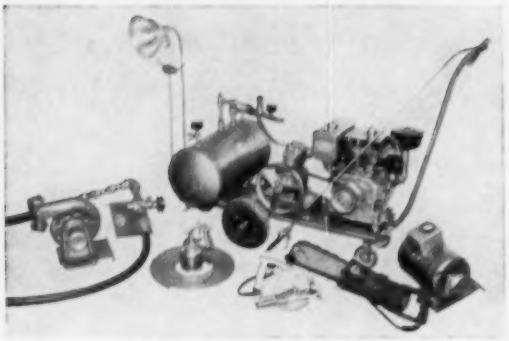


Spindle speeds from ¼ to 3 r.p.m. are obtained by turning a dial. Also the flux hopper is self-contained and travels with the welding head. Utilizing the submerged arc principle of automatic welding, the K-2M is equipped with the Mir-O-Col 944 automatic welding head and simplified control panel.

The unit needs no anchoring to the floor for most applications. A totally enclosed base prevents flux from sifting over motors and working parts contained inside. *Mir-O-Col Alloy Co., Inc.*

Check No. 3 On The Time-Saver Card

What's New... Use the handy Time-Saver Cards



Power-Slave Is Multiple Jobs Unit

The Power-Slave can compress, pump, or generate, and can switch from one operation to another in less than 60 seconds. Mounted on ball-bearing swiveling tricycle gear, the Power-Slave is highly mobile and easily handled.

This power plant offers in one package all of the separate functions that up to now had been performed by single-purpose generators, pumps, air compressors, and spraying equipment. One power plant takes the place of four.

Power-Slave is available in two models. Model 60 is powered by a 6-hp. engine and Model 25 is equipped with a 2½-hp. engine. Both models operate the same type of equipment but in each case the equipment is sized to the horsepower.

The Model 60 comes equipped with four basic pieces of equipment: a generator, an air compressor and tank assembly, a pump, and a spray boom. The generator develops 2,500 watts of 115-volt a.c. power. Large-volume, (up to 15,000 gal. per hour), self-priming pumps are included as a part of the basic equipment. Quick-connecting hoses are also a part of the package. The twin-cylinder compressor develops up to 150 psi. pressure. *Master Mechanic Manufacturing Co.*

Check No. 4 On The Time-Saver Card

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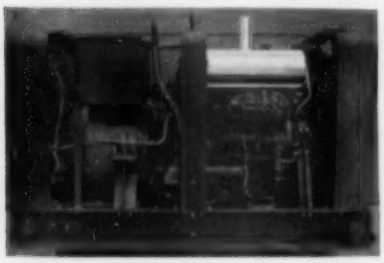

Silencer Eliminates Engine Manifold

A silencer which also doubles as a manifold was designed specifically for use on a generator set powered by a DIX 6D Hercules engine. The new muffler saves weight and makes possible a smaller, more compact generator set. No manifold is required, since the silencer is mounted directly to the engine block by means of a flange.

Interior of the silencer features an efficient louver design. As the exhaust bursts enter the chamber, they are directed through louvers along the outer shell which cools them and reduces their volume. More louvers direct the gases back into the center of the silencer and out into the atmosphere. This design smooths out the pulsations and produces a steady, whisperlike exhaust flow. Large, free-flowing passages prevent plugging due to excessive carbon or sludge deposits. The new silencer is made of stainless steel for resistance to corrosion and is welded throughout for longer life. *Kittell Muffler & Engineering Co.*

Check No. 5 On The Time-Saver Card

●

Hydramotor Valve Produced For High-Pressure Service

A new series of Hydramotor valves has been designed specifically for on-off control or safety shutdown of gas-fired industrial burners. The new Hydramotor valves, which are operated by an electrohydraulic pump, have been developed particularly for gas-service applications where the 5-psi. limitations of the ordinary diaphragm-type valve are exceeded.

The new series operate in the 5 to 35-psi. range, and feature extremely rapid shutoff combined with a slow-opening cycle. Shutoff time is 1 second in all models from the smallest valve in the present line, which is for 1-in. pipe, to the largest, for 6-in. pipe. All of them are of the two-wire current failure type, automatically moving to normally open or closed positions when electrical current is interrupted.

Opening time varies from 6 to 28 seconds among the different models, depending upon pipe size and type of actuator. A wide selection of speeds is available to suit the particular needs of the installation. Generally the longer opening time is designed for the proper ignition of gases. *General Controls Co.*

Check No. 6 On The Time-Saver Card

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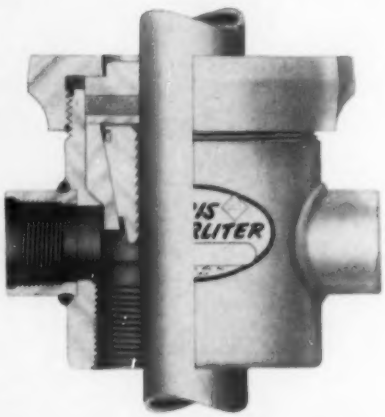

WCN Tubing Head Designed For Low-Pressure Wells

A new Type WCN tubing head for low-pressure wells is rated at 1,000-psi. cold working pressure. The Type WCN head is adaptable to fracturing, acidizing, repressuring, water flooding, and various other completion and production methods.

Full opening and equipped with slips to suspend 2 or 2½-in. tubing, the head is furnished in 5½-in. female-casing size, with two 2-in. side outlets. It is also available in 7-in. male-casing size. Over-all height of the 5½-in. head is 8⅜ in. and the 7-in. head is 10⅞ in. The adjusting cap provides a broad tubing spider base.

The WCN tubing head is designed to provide all the features of higher rated heads, for economical use within its recommended pressure rating. *W. C. Norris Manufacturer, Inc.*

Check No. 7 On The Time-Saver Card

the Sign of Dependable SERVICE

ON OIL FIELD SUPPLIES

The men in the field who rely on United Supply will tell you that there's no finer or more dependable service ANYWHERE! United Supply's conveniently located stores—fast, reliable service anywhere at any time and nationally known quality products all add up to best supply service in the industry. Let United Supply show you the way to cut down time to the bone . . . Just call us on your next supply problem—or visit your nearest United Supply Store.

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TULSA, OKLAHOMA

Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

COURTESY • SERVICE • DEPENDABILITY

What's New... Use the handy Time-Saver Cards

Wound-Rotor Motor Is Available in 1,800 Rating

A new explosionproof, wound-rotor motor to bear the Underwriters' Laboratories label, is available at 1,800 r.p.m. and slower speeds, in frames 284 to 505, in standard-enclosed or explosionproof construction.

In general, the new motor is applicable where very low starting current, high starting torque, smooth acceleration, jogging or variable adjustable speed dictate the use of a wound-rotor motor and where moist, dirty, corrosive, or hazardous atmospheres require a totally enclosed motor.

The frame of the motor has an extended front end to include the slip rings, brushes, and brush rigging in one enclosure. The elongation provides added surface for heat dispersal. Removal of two large pipe plugs from the upper quadrants of the frame on the slip-ring end provides large openings for maintenance work and adjustment of brushes and brush rigging. Slip-ring leads enter a separate cast-iron conduit box and the lead opening in the frame is sealed. *Allis-Chalmers Manufacturing Co.*

Check No. 8 On The Time-Saver Card

Here's why YOU SHOULD

CONTROL CORROSION WITH Chromates

no other chemical is as powerful an inhibitor against the corrosive action of water on iron or steel.

no other chemical is as effective against bimetallic corrosion.

no other chemical provides as satisfactory protection in high-chloride water or brines.

no other chemical completely nullifies the corrosive effect of aeration.

Mutual Bichromates and Chromates are being used as corrosion inhibitors in an ever-increasing number of applications. In most instances the amount of chromate is so small and the cost so low when compared to the value of the equipment protected that chromate is preferred over other inhibitors.

Typical uses for Mutual Chromate corrosion inhibitors are in cooling towers, heat exchangers, condensers, engine and compressor jackets, boilers and idle equipment, hydraulic systems and refrigerating brines. Write to our Research and Development Division for recommendations for using Chromates in your equipment or process.

MUTUAL CHEMICAL COMPANY OF AMERICA

SINCE 1845

99 PARK AVENUE • NEW YORK 16, N. Y.

Telelink Provides Low-Cost Reliable Service

TCR-12 Telelink, a new low-cost communication microwave system, is engineered to provide reliable service for one or two-channel operation. Its low-cost features include low equipment cost, low installation cost, low operational cost. No outside housing is required. Standardized, long-life parts are used throughout. All components were selected to operate well within rated values.

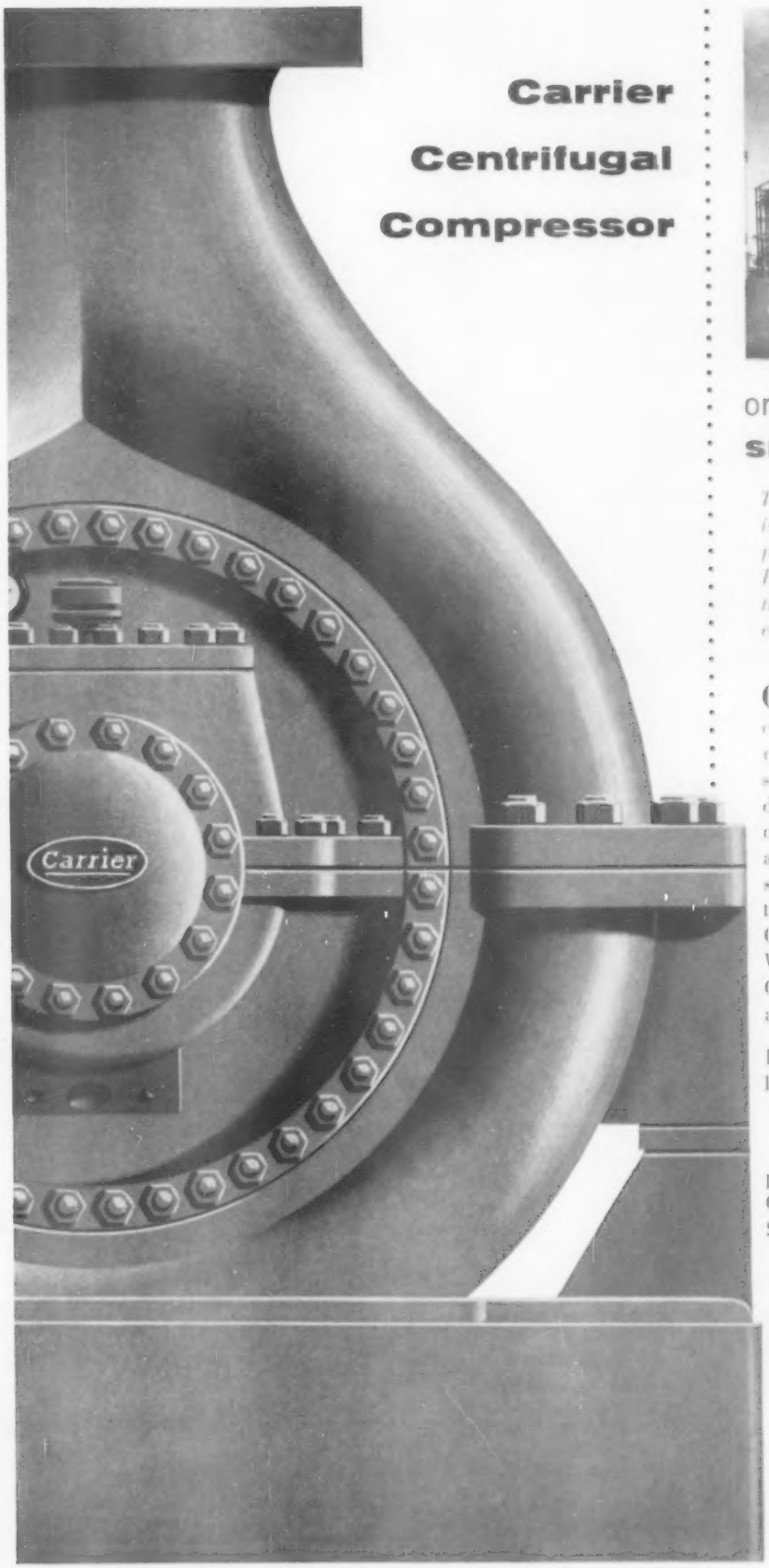
Telelink will fulfill a definite need for many applications within pipeline companies, gathering systems, and drilling companies. *Raytheon Corp.*

Check No. 9 On The Time-Saver Card

Kwik-Chek Gas Analyzers Give On-The-Job Readings

New Kwik-Chek gas analyzers are for speedy and accurate on-the-job determinations of carbon dioxide or oxygen in flue gases, furnace atmospheres, and other gas mixtures.

Complete kits are furnished for carbon dioxide, oxygen, or both. All needed components and instructions are contained in the metal carrying case. Simplicity of operation, speed of analysis, and ease of making an accurate



Carrier Centrifugal Compressor

on the job at

Sinclair Refining Co.

This Carrier Centrifugal Compressor is on the job at Sinclair Refining Company's Corpus Christi, Texas, refinery. Handling 2195 c/m of isobutane, the compressor is turbine-driven by exhaust steam.

Carrier makes a complete line of centrifugals for gas compression and refrigeration—up to 10,000 hp in a single unit. There are hundreds of these dependable, efficient Carrier machines on the job at dozens of chemical plants and refineries across the country—serving such companies as The Atlantic Refining Company, Reichhold Chemicals Co., Cities Service Co., Wyandotte Chemicals Corp., Standard Oil Company of California. May we assist *you?*

If you'd like a copy of our informative booklet,

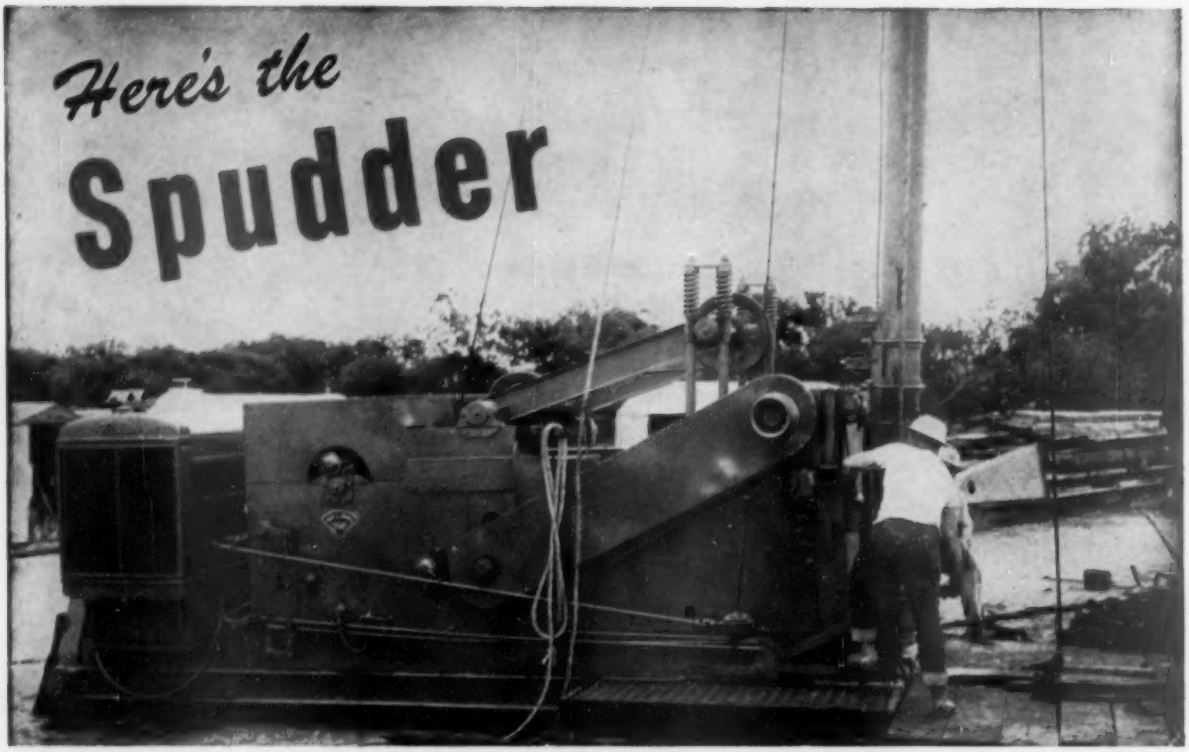
"Centrifugal Compressors for Industry,"

please call your nearest Carrier office. Or write direct to Carrier Corporation, Syracuse, New York.

Carrier

centrifugal compressors

refrigerating equipment



Model "42", 2 drum tailing-in Spudder owned by Carl Short Drilling Co., Hominy, Okla.

-YOU have been asking for -

With a SPUDDING ACTION that Drops those Tools for MAXIMUM DRILLING SPEED

BUT MORE than just a spudder there's:

POWER for fast bailing, swabbing and rod and tubing work.

DRUMS that spool perfectly with plenty of line capacity.

BIG BRAKES that handle the load safely.

EASY to operate—air friction clutches where needed and all service clutches operated by air.

EASY to service—most bearings are pre-lubricated and sealed and require no attention—other points of lubrication are easily serviced from outside the machine.

THREE SIZES—Trailer mounted, truck mounted, or skid type with TWO or THREE drums.

MODELS—"42" Rated to 6000 Ft. Engines up to 145 HP. "36" Rated to 4500 Ft. Engines up to 145 HP. "32" Rated to 2500 Ft. Engines up to 110 HP.

A wide choice of engine makes and sizes can be furnished on any of these rigs.

SINGLE POLE or TWO POLE telescoping masts to fit the machine and the job with single line raising and telescoping, requiring only one spooling on drum to set up and one spooling to let down. Pre-lubricated ball bearings in crown sheaves that require no attention.

COOPER TAILING IN SPUDDERS WILL MAKE YOU MORE MONEY PER DOLLAR INVESTED

FRED E. Cooper, Inc.

P. O. Box 1890 TULSA, OKLA.

Branches—Houston, Texas; Odessa, Texas; Los Angeles, California; and Olney, Illinois

reading are featured. No skill is required to operate the new analyzer. A rubber hand pump, supplied in each kit, is connected to the source of the gas by rubber tubing. By a few squeezes, a sample is in the Kwik-Chek. A shake or two and a needle registers the percentage of carbon dioxide or oxygen present in the sample on a dial. On a standard scale from 0 to 20 per cent, accurate reproducible results are shown directly to ¼ per cent. *Burrell Corp.*

Check No. 10 On The Time-Saver Card

●

New Reamer Line Is Made To Handle Entire Range

A new line of oil-well reamers is designed to handle the entire range of reaming operations. Cutter assemblies are simple to replace, but cannot be removed accidentally. They are available for any model in three different types that suit a wide diversity of subsurface conditions.

The line includes a three-point, near-bit reamer with one set of cutters for assuring full-hole gage as the bit wears, and for use as a fulcrum in directional drilling where drill-collar support is required near the bit; a three-point regular reamer with one set of cutters in the middle of the body for reaming and stabilizing in normal drilling; and a six-point stabilizer reamer with two sets of cutters staggered so as to contact a greater section of hole. This latter is especially good for reaming just before setting pipe. A nine-point reamer with three sets of staggered cutters is specifically designed for straight-hole drilling in hard formations.

The bodies of these reamers are of streamline design to minimize hole restriction, and yet are of sufficiently rugged construction to withstand the highest torque. Roller-cutter reamers are designed to be run into the hole with either end up, thus making them a more versatile tool and reducing the need for subs. Also note that the cutters are set at an angle to give maximum shearing action combined with a tendency to screw out of the hole. *Grant Oil Tool Co.*

Check No. 11 On The Time-Saver Card

New Electrode Gives High Tensile Strength

Jetweld 2 HT, a new electrode for welding high-tensile-strength joints, contains iron powder in the coating which gives it the advantages of speed and performance associated with this new type electrode. Jetweld 2 HT is especially designed for high-speed welding

and here's why: It absorbs water instantly from gases and liquids in either a static or flowing system, is insoluble and will not swell or disintegrate in water. FLORITE gives a low dew point depression, and agressively resists "poisoning effects" which permanently destroy adsorption qualities.

Let us prove that Florite is the most economical of the granular agents and best suited to your desiccant requirements, too. Inquiries receive prompt attention.

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What's New... Use the handy Time-Saver Cards

of flat-fillet and deep-groove joints where high tensile strength and low crack sensitivity are required. It will give the lowest cost per foot of X-ray-quality weld and has extremely easy slag removal, top physical properties, and smooth appearance.

The new electrode will weld some butt and deep-groove joints as much as 50 per cent faster than conventional electrodes. It operates on either a.c. or d.c., with a.c. operation preferred. The bead has excellent wash-in. Ease of operation and low fatigue factor result from the drag technique used with heavy coatings. Spatter is reduced to a minimum, and the smooth appearance on cover-pass welds meets automatic-welding standards.

Typical stress-relieved values for the new electrode are: tensile, 76,700 psi.; yield, 64,300 psi.; elongation, 27 per cent. Jetweld 2 HT is classified as E-7020 and is available in 7/32-in. diameter. *The Lincoln Electric Co.*

Check No. 12 On The Time-Saver Card

●

New Thread Dope Gives Permanent Lead Plating

Big D Dope, a new lubricant seal is for all types of threaded fittings. A single application provides permanent lead plating, island high, thus permitting repeated assembly and disassembly of any size threaded connections without redoping, and without damage to threads.

The product has passed rigid tests as a lubricant seal for drill pipe and tool joints; nuts and studs on all types of pumps and engines; large plug valves; heavy, open-worm gears; line grooves on sheaves; and as a packing sealer and steel-cable lubricant.

The compound is warranted antigall, noncorrosive, nonhardening, leakproof and is resistant to steam, gas, oil, air, chemicals, alkali, acids, ammonia, and all hydrocarbons, under the most punishing pressures, temperatures and vacuums. *C. H. Dragert Co.*

Check No. 13 On The Time-Saver Card

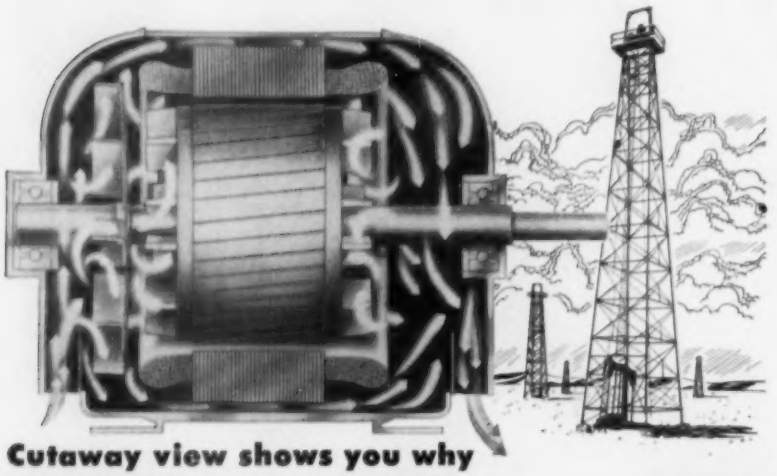
●

Tougher Alloy Used In New Ball and Seat Valves

A new ball-and-seat valve for oil-well pumps is called DuMore, and it is corrosionproof, nonmagnetic, not affected by high temperatures, and is particularly suited to highly abrasive fluids.

DuMore is an alloy that approaches the hardness of tungsten carbide, yet it is not brittle, and therefore resists wear even under the hardest pumping conditions. The valves are available in a full range of A.P.I. sizes in both flat and rib-type styles. *Harbison-Fischer Manufacturing Co.*

Check No. 14 On The Time-Saver Card



Cutaway view shows you why

R&M Oil Country Motors run COOL!

"Clean-sweep" ventilation insures longer motor life

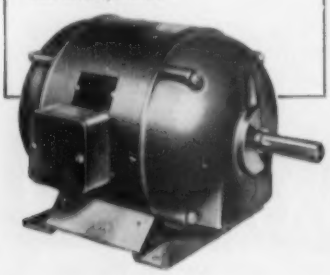
There's an R&M "All-Weather" motor that's built for YOUR job!

Triple-Rated—for changing power needs. Slight additional cost is quickly written off by power savings. You buy power only for the connected horsepower you need. As requirements change, you change the horsepower—*without changing motors.*

High Slip—ideal for the reciprocating load requirements of oil pumping.

High Torque—to meet heavy starting problems.

Standard Integrals—from 1 to 125 horsepower.



...and greater stamina for overloads

Cool running—hour after hour at full capacity—is one of the big reasons why so many oil field men swear by R & M "All-Weather" Motors. These motors are designed to permit ample circulation of high velocity air—to carry off motor heat, as well as heat developed by exposure to the hot sun. And, openings are drip-proof, rain-proof; screened to keep rodents out. Special treatment inside and out resists rust and corrosion. Heavy duty bearings are sealed to retain lubricant. In short, here are motors that will give you years of faithful service.

It will pay you to get the whole story!

Write today for name of your nearest R & M distributor. He can prove—in dollars and cents—that all these "extras" in R & M motors are furnished *at a standard motor price!* Be sure to ask for R & M bulletin on oil field motors; it's packed with good, usable information.

R&M "All-Weather" Oil Country MOTORS

ROBBINS & MYERS, INC.
Springfield 103, Ohio • Brantford, Ontario

"All-Weather" is the trademark of Robbins & Myers, Inc.

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Pressurized Hydropads Now Control Pipeline Surges. The Hydropad is a surge arrester for pipeline and instrument protection where there are sudden velocity changes. The unit features a welded bellows of stainless steel filled with nitrogen. Besides specifications, this bulletin contains basic data in the form of tables, formulas, and charts essential to understanding and application of Hydropad principles to surge conditions. *Cook Electric Co.*

Check No. 15 On The Time-Saver Card

●

Superior G-825 Gas Drilling Engines are described in a new, illustrated, eight-page bulletin, No. 427. Ratings of engine are 535 b.hp. for the six-cylinder model and 705 b.hp. for the eight-cylinder model. The brochure presents construction details, performance data, specifications, and dimensions. *The National Supply Co.*

Check No. 16 On The Time-Saver Card

●

ACF Lubricated Plug Valves. In pressure ranges from 175 to 500 psi. plug valves described in this new 40-page Catalog No. 5-1954, include round and rectangular-port openings, semisteel, multiport, v-port and diamond port, steam jacketed, and short pattern. The valves are offered in metals and alloys to meet most requirements. *ACF Industries, Inc.*

Check No. 17 On The Time-Saver Card

●

Caposite, a six-page fold-out, describes a preformed, amosite-asbestos, thermal insulation for the oil industry. Illustrations show the product installed at a number of refineries. Data tables show thermal efficiency, toughness, temperature resistance, permanence, and economy. *The Cape Asbestos Co., Ltd.*

Check No. 18 On The Time-Saver Card

●

Palcotan, Bulletin 4-01 is a data sheet featuring a mud-conditioning chemical for effective control of viscosity, gel strength, and water loss. The product is a water-soluble, organic extract of

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(AIR • GAS • AMMONIA)

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Check THESE VOSS VALVE ADVANTAGES:

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Our detailed proposal for increasing the efficiency of your compressor will be sent you without obligation. Send us the name, bore, stroke, and speed of your machine.

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vacuum

and

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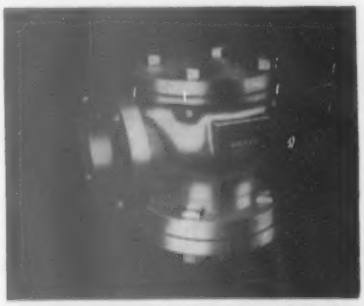

● Ideally suited for a wide variety of vacuum and pressure relief requirements. Cast steel housings. Bronze or stainless steel trim. 3″ x 3″; 4″ x 4″; and 6″ x 6″ sizes. Standard A.S.A. flanges. Vacuum setting, 1½ oz. to 1 lbs. per square inch. Pressure relief valves provided with a lever and weight for settings from 2 lbs. to 30 lbs. per square inch as desired. Write for fully descriptive data sheet.

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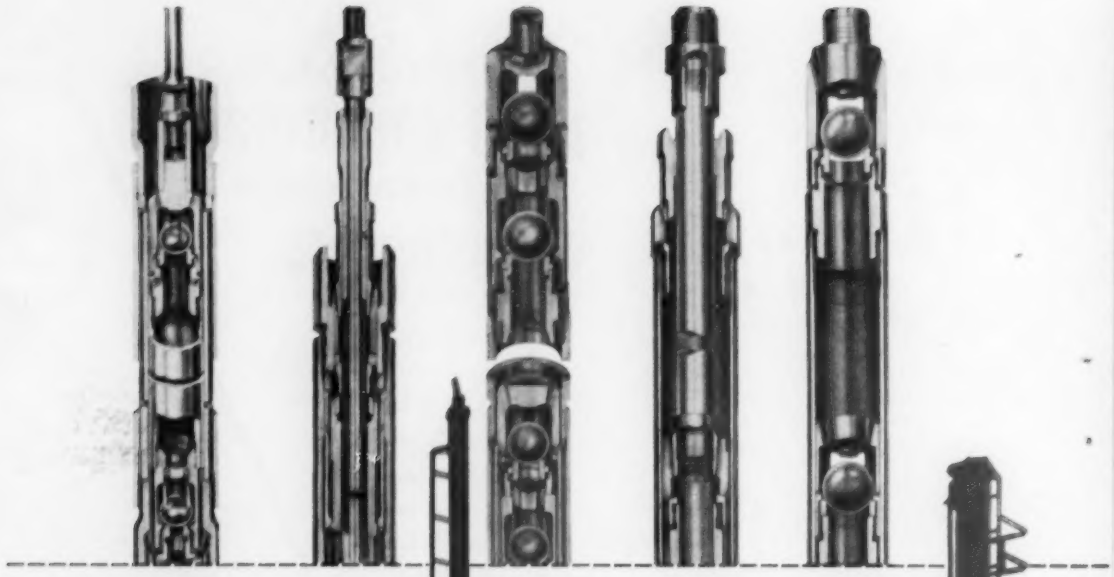

DEEPWELL PLUNGER PUMPS Tubing Liner Type

DEEPWELL PLUNGER PUMPS Rod Liner Type Stationary Barrel

DEEPWELL PLUNGER PUMPS Rod Liner Type Traveling Barrel

SURE-SEAL Rod Type Stationary Barrel

SURE-SEAL Traveling Barrel

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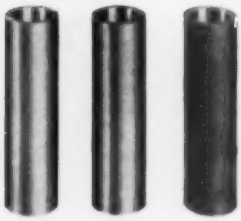
SEATS AND BALLS Ribbed Flat

"HYDRAX" HYDRAULIC PUMPING UNITS 6′ and 10′ models



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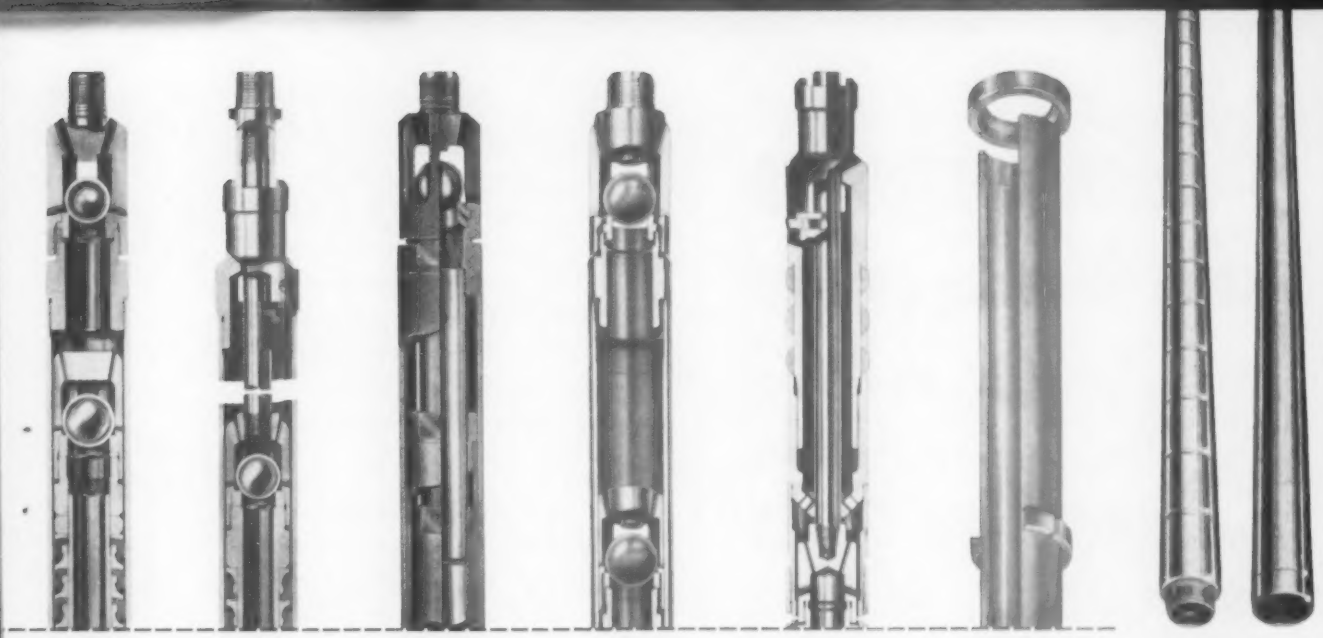

KUP-PAK PUMPS Traveling Type | KUP-PAK PUMPS Stationary Type | TRIAX PUMPS Traveling Barrel | DOUBLE DISPLACEMENT PUMPS | TWO ZONE Pumps | FULL LINER Pumps | PLUNGERS Grooved Plain

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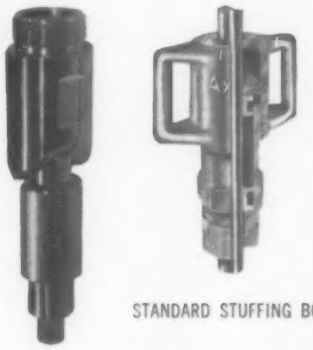

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Over 62 years of Oil Country experience lie behind each Axelson product. Each has been developed to answer a definite need and each is a high quality, technically correct piece of pumping equipment. In the complete Axelson line there is a right combination for every well condition.

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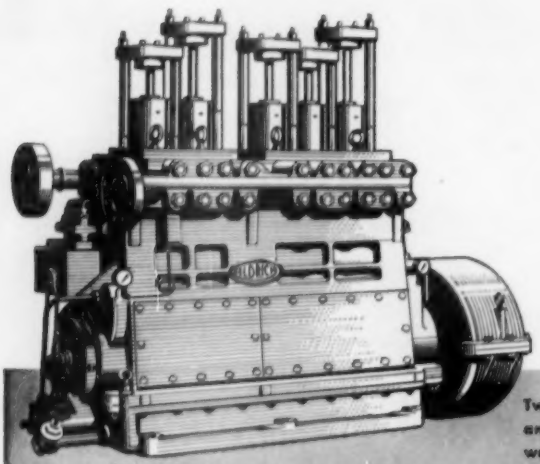
For UNINTERRUPTED water flooding service

. . . it will pay you to use Aldrich Direct Flow Pumps

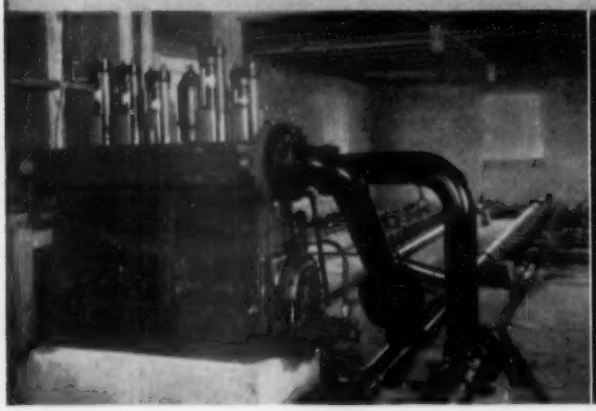


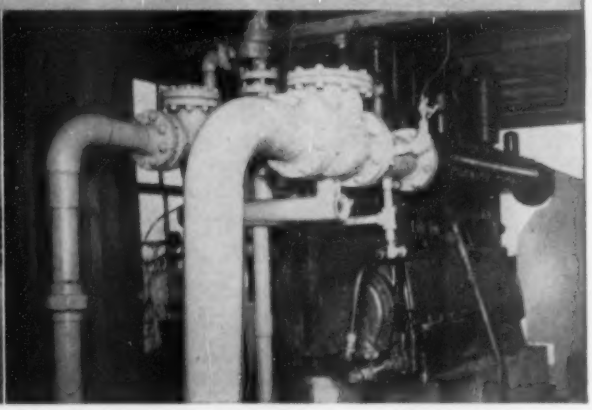
Their record will tell you why. On a large number of water flood projects throughout the country, Aldrich Pumps are providing continuous operation at high pressure . . . critical "musts" in this form of secondary recovery. Operators have found them not only dependable, but also highly efficient.

For water flooding Aldrich can supply you with a pump to meet any volume or pressure requirements you may have. Aldrich Pumps range from a 3"-50 hp triplex, through 5" triplex and multiplex, to the 6" series ranging up to 900 hp.

Get in touch with your nearest Aldrich Representative . . . or write us directly. Data sheets are always available upon request.

Two Aldrich Direct Flow Pumps on the job on water flood operations. At left is an Aldrich 5" stroke motor-driven Quintuplex Pump used for pumping salt water at the Osage #2 property of Winona Oil Company, Flat Rock, Okla. On the right is an installation at Skiles Oil Company, Mt. Carmel, Ill., where a similar Aldrich unit pumps fresh water at 120 gpm against 1450 psi.





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redwood bark. Charts show the effect of Palcotan on treating 8 per cent bentonite slurry, a cement-contaminated-Gulf Coast mud, and a laboratory mud prepared from clay and bentonite. *The Pacific Lumber Co.*

Check No. 19 On The Time-Saver Card

●

Turbine Pumps for Industry is the title of a new eight-page bulletin (No. 735-1) which describes and illustrates the latest models of vertical turbine pumps. These pumps are part of the new line being developed by the Hydraulic Products group of the corporation. The bulletin shows characteristic curves and gives a detailed description of principal components. Drawings showing typical applications are included. *Pacific Coast Works, A. O. Smith Corp.*

Check No. 20 On The Time-Saver Card

●

Moulded Fabric Bearings. A new 32-page brochure illustrates applications and describes the properties of molded fabric bearings, wear plates, and other parts. It shows bearings made for grease or oil-lubricated, water-lubricated, unlubricated, and acid-resistant services. Journal sizes to 48-in. diameter and larger are available. The bulletin also illustrates a great variety of molded asbestos brake blocks, frictions, cones, and other shapes. *Gatke Corp.*

Check No. 21 On The Time-Saver Card

●

P&H Model 105 TC Truck Crane. A new bulletin on the 105 TC truck crane is designated as TX-159. Offered as a big brother to P&H Miti-Mite, Model 105 TC is available only on its own precision-built carrier. It is rated at a full 10-ton crane capacity, and is easily converted to all other services, handling standard buckets at efficient boom lengths. This machine is built with the rugged power box that carries all driving machinery in a single, sealed transmission running in oil. *Harnischfeger Corp.*

Check No. 22 On The Time-Saver Card

●

Unimatic CW-4 Detachable Ditcher. The prime features of the CW-4 detachable ditcher are discussed and illustrated in a two-color, eight-page catalog, including the Unimatic drive, digging-wheel drive, and conveyor, all of which are hydraulic. The advantages of operating this combination of tractor and ditcher as well as the various uses to which this multipurpose machine can be applied are also discussed. A pictorial story illustrating the detaching procedure and over-all specifications complete this booklet. *Unimatic Corp.*

Check No. 23 On The Time-Saver Card

●

Power Giant Power Units. Complete specifications of engines, standard equipment, and housing are given in this six-page brochure. It includes horsepower, torque, and fuel-consumption figures of four 4 and 6-cylinder Power Giant engines. *Industrial Engine Department, Willys Motors, Inc.*

Check No. 24 On The Time-Saver Card

●

Pipelines for Petroleum Transportation. Bulletin PL-1 discusses the problem involved in transporting liquid petroleum products through pipelines. First in a series the bulletin describes in general terms a typical pipeline system, the variables to be measured, and some of the problems of pipeline control. *Industrial Division, Minneapolis-Honeywell Regulator Co.*

Check No. 25 On The Time-Saver Card

●

Internal Hi-eF Purifiers. An internal-type purifier (scrubber) for delivering clean vapor and gases from steam drums, flash tanks, evaporators, packed towers, bubble-cap towers, deodorizers, and stills is described in a recently published four-page, two-color bulletin. These purifiers prevent equipment and processes following the vessel from being damaged by entrainment or slugs, and in evaporator operation retain valuable solids which prevent loss of product and permit the vessel to be operated at greater capacity. The folder contains dimensional drawing illustrating the use of purifiers inside two typical installations, steam drums, and bubble-cap towers. The bulletin also has a cutaway drawing illustrating flow of vapor through the unit. *The V. D. Anderson Co.*

Check No. 26 On The Time-Saver Card

●

String-A-Lite, a new 2-color, 12-page bulletin covers lighting and tool lines for industrial needs. Numbered B52, this new bulletin illustrates and provides complete specifications on the latest available designs. These assemblies consist of suitable end connectors and molded neoprene outlets, factory-molded into 50 or 100-ft. sections of standard rubber-covered cord. They can be adapted to varying job requirements by the addition or deletion of interconnecting sections. *Joy Manufacturing Co.*

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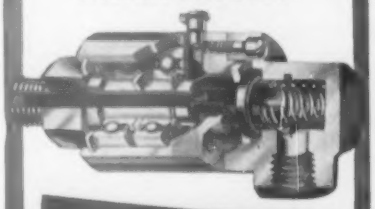
REDUCE

"Down-Time" and Maintenance



Specify DEUBLIN ROTATING AIR UNIONS

For dependable, low-cost transmission of air from stationary to rotating machine parts, it will pay you to use Deublin Rotating Air Unions. Following are typical advantages engineered into these precision-built unions which combine to reduce "down-time" and save on maintenance.

✓ **LEAKPROOF AIR SEAL**
Hardened and lapped Graph-Mo tool steel running against a lapped carbon sealing face provides the best known air-sealing method.

✓ **NEW BALANCED SEALING**
Air is balanced within the unit so line pressures can not increase load on seal faces, thus increasing seal life.

✓ **MINIMUM TORQUE**
Starting and running torque held to constant minimum through balanced sealing and two single row, sealed-for-life ball bearings. This permits higher operating speeds.

✓ **DURABLE CONSTRUCTION**
Light weight, yet built for long trouble-free performance.

✓ **SIMPLIFIED MAINTENANCE**
Only the seal faces are expendable. Easily replaceable on the job.

✓ **OPERATING DATA**
Maximum speed, 3500 r.p.m. Maximum pressure, 150 p.s.i.

Ask your local supply store for details and prices.

Get the facts about the new Deublin CHATTER-PROOF Quick-Release Valve

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It's the Rule
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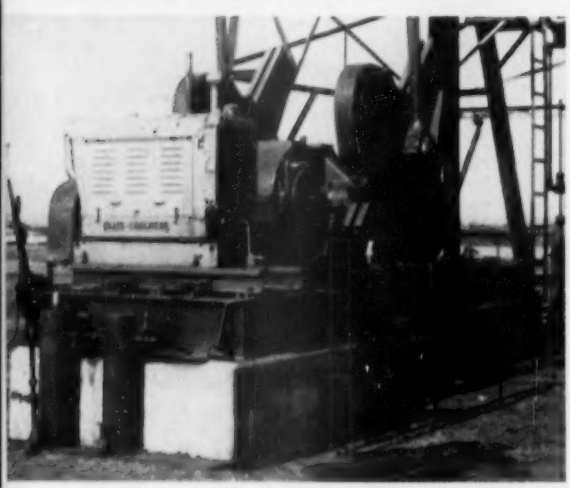
For Allis-Chalmers
Engines to Give Long
Trouble Free Service

ALLIS-CHALMERS ENGINES



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1. Eight years of continuous 24 hour service on pumping well before overhaul.

2. Nine years, 10 Months' continuous 24 hour service on pumping well before overhaul.

3. Over Four Years, pumping 8,800,000 barrels of oil on pipe line pump and going strong. Compression normal, engine running like new—no indication of any repairs needed.

You can expect long service from Allis-Chalmers High Torque slow speed engine.

FOUR Popular SIZES

E — 563, 563 cu. in.
U — 318, 318 cu. in.
W — 226, 226 cu. in.
B — 125, 125 cu. in.

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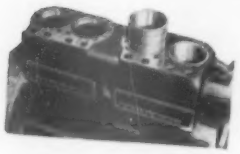
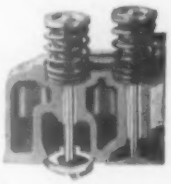
Here's Why!

ALLIS-CHALMERS ENGINES COST LESS TO OPERATE

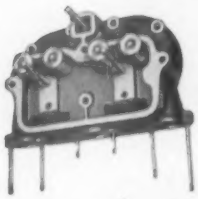
All Allis-Chalmers Engines have Removable Cylinder Sleeves



Valve-in-Head construction



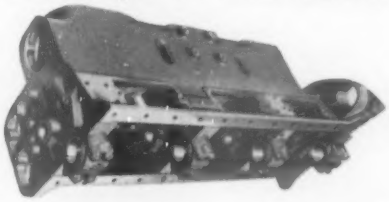
and on the larger size engines one Interchangeable



Head to each two cylinders. Permits one

man to make repairs at the location.

Heavy



Blocks keep parts in proper alignment; Pressure Lubrication to all internal moving parts. Mass Production keeps first cost and repair parts prices low. Sold and serviced by the organization, who care enough to service every engine when it is put on the job. Repair parts service available in all oil producing areas through the vast facilities of the Allis-Chalmers branches and dealers and Fred E. Cooper, Inc. branches.

COMPARE

1. Allis-Chalmers Quality
2. Allis-Chalmers First Cost
3. Allis-Chalmers Parts Cost

With those of any other engine.

FRED E. Cooper, Inc.

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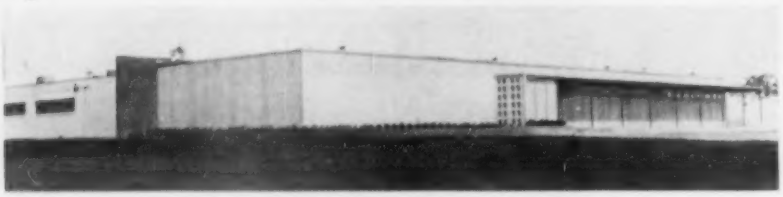
EQUIPMENT MEN . . . in the News

Chemical Process Builds Plant at Breckenridge



Chemical Process' new building at Breckenridge.

A new 10,000-sq.-ft. home-office and laboratory building of Chemical Process Co. was formally opened in Breckenridge, Tex., in October.

An estimated total of approximately 1,000 invited oil-industry leaders and company friends attended a 6-hour open house and inspected the new building, located on the western edge of Breckenridge on Highway 180.

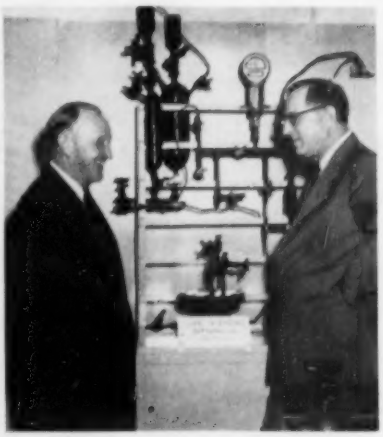
The L-shaped, single-story structure houses both the executive and administrative offices of Chemical Process and the firm's research, chemical, and geological laboratories. The company also maintains its own truck building and maintenance shops in Breckenridge as well as a district office and oil-and-gas-well treating station.

Chemical Process services include chemical and fracturing treatment of oil and gas wells for the petroleum industry. The firm was founded in 1932, and its services have been linked with the growth of chemical and fracturing treatment of wells since that time.

President of Chemical Process is C. K. West, one of the founders of the company. He and G. R. Whitney, vice president and general manager, joined other company executives and office personnel in guiding guests through the firm's new building.

West has seen the company grow from the acidizing of its first well to its present size, with 6 division offices and 23 district offices and treating stations in Texas, Oklahoma, New Mexico, Louisiana, and Kansas.

Equipment used by the firm in serving its customers include approximately 400 pieces of mobile equipment, plus a short-wave radio network that permits speedy communication between all stations of the company's widespread operations. More than 60 of the company's fleet of automobiles, as well as 2 airplanes and several trucks are equipped with two-way radios. Chemical Process operates 5 radio stations in Breckenridge, as well as others located at 13 other Texas points, 6 in Kansas and stations in Louisiana, New Mexico, and Oklahoma.



C. K. West, president, and G. R. Whitney, vice president and general manager, Chemical Process Co.

The 24-year-old oil-industry servicing company maintains division offices at Breckenridge, Borger, and Midland, Tex.; Oklahoma City; Shreveport; and Russell, Kans. District-office and treating-station locations include: Wichita, Great Bend, Lakin, Hugoton, Hill City, and Russell, Kans.; Enid, Guymon, Pauls Valley, and Seminole, Okla.; Abilene, Borger, Breckenridge, Luling, Levelland, Odessa, Pearsall, Snyder, San Angelo, Tyler, and Wichita Falls, Tex.; Shreveport; and Hobbs, N. M. Sales and engineering offices also are maintained in Tulsa; Shreveport; Graham, Tex.; Midland; and Breckenridge.

Chemical Process officials, in addition to West and Whitney, include M. E. Chapman, vice president, engineering and sales, Tulsa; R. G. Miller, vice president and general manager, shooting division, Fort Worth; C. F. Hogan, assistant general manager, equipment and purchasing; V. C. White, chief petroleum engineer; L. K. Kaltenberger, chief electrical (Permeter) engineer; B. L. Crone, chief field engineer; W. H. Fredenburg, safety director; P. W. Morrison, sales manager; J. V. Derrick, operations manager; R. L. Davis, office manager; O. E. Wynn, credit manager; and E. G. Rhenstrom, public relations manager.

Continental Shifts Hindman To Gardner-Denver Sales

The Continental Supply Co. has announced the appointment of B. L. Hindman as special representative for the sale of Gardner-Denver mud pumps. His office will be located at the company's headquarters in Dallas.

Hindman, who joined Continental in 1930, for the past 2 years has been in Shreveport, La., as assistant division manager of the Arkansas, North Louisiana, Mississippi, and East Texas division. Among other positions he has held with Continental are assistant district manager at Jackson, Miss., and salesman at Longview, Tex.

Lufkin Returns Gallia To Houston Service Post

V. L. Gallia, who has been sales and service engineer for Lufkin Foundry & Machine Co., in Brookhaven, Miss., since 1949, has been transferred back to the Houston office in the Gulf Coast division as service manager.

Gallia was previously in the Houston office as service engineer for the Gulf Coast division from mid-1947 until he was moved to Brookhaven in 1949.

Goltz Is Catalysts Head In New York for Davison

Appointment of Roy L. Goltz as New York district manager for petroleum catalysts of Davison Chemical Co. division of W. R. Grace & Co., has been announced by Page Edmunds, sales manager of the department.

Goltz will make his headquarters at Davison's New York office. He has been district manager for Ethyl Corp.,

New York City, for a number of years. Prior to that assignment he served as field representative and sales coordinator for that company, working closely with people in the petroleum industry in New York, Pennsylvania, New Jersey, and New England.

New Supply Firm Organized To Serve Gulf Coast Area

ED MATHER, JR.

Buffalo Industrial Supply Co. has been organized at Houston as a general partnership, composed of Ed Mather, Jr., J. M. Townsend, Jr., and Norbert H. Acuff. These three men have a collective total of 46 years' successfully selling users in the petroleum industry.

J. M. TOWNSEND

N. H. ACUFF

The new firm will stock and job lines that will appeal to the various users of industrial and piping supplies relative to the industries located in Gulf Coast region.

Mather has previously been employed with Superior Iron Works & Supply Co. as an industrial salesman from September 1949 through July 1954, and before that, with Norvel Wilder Supply Co. on inside sales work.

Townsend has formerly been employed with Houston Oil Field Material Co., Inc., and Briggs-Weaver Machinery Co. with considerable experience in warehousing and sales contact in the drilling and production field, as well as in industrial circles in and around Houston.

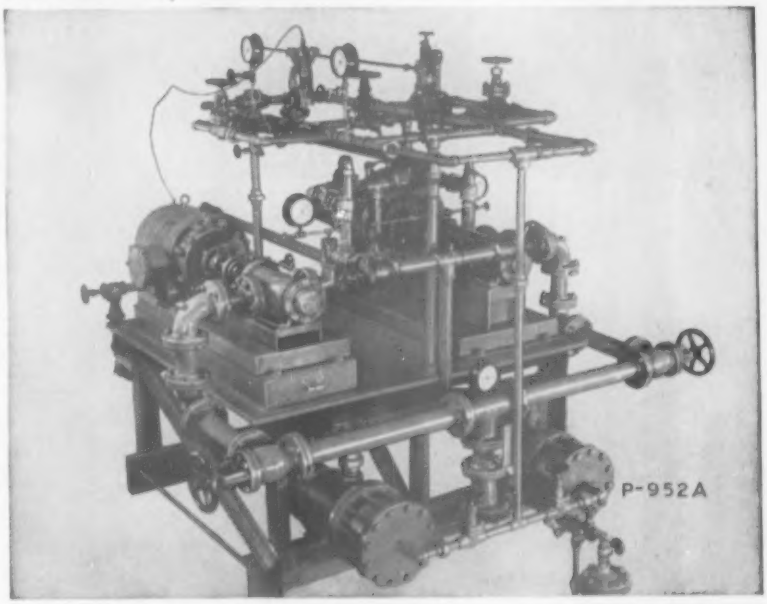
Acuff has previously been employed by The Corbett Corp. as a salesman, calling upon the industrial trade in and around the Gulf Coast area.

S. F. Hines is office manager and inside salesman for the company.

Companies and produces represented by Buffalo Industrial Supply are: Tube Turns, Inc.; Spang-Chalfant, Division of The National Supply Co.; Reading, Pratt & Cady Valves Division, American Chain & Cable Co.; Marsh Instrument Co.; Yale Machine Works; W. C. Norris Manufacturer, Inc.; Wat-

Complete Range of Sizes and Models in Both Medium and High Pressure Types

MORE COMPACT THAN EVER . .



P-952A—Steam Turbine and Electric Motor drive gives flexibility in this compact Model P-ES2H size No. 25 unit.

NATIONAL AIROIL

FUEL OIL PUMPING *AND* HEATING UNITS

NATIONAL AIROIL Fuel Oil Pumping and Heating Units are specially designed to prepare, for combustion, all grades of fuel oil including No. 6 or Bunker "C" Oil and residuums. They will draw fuel oil from above ground or underground tanks, preheat it to proper constant temperature and deliver it to Oil Burners at an even pressure, best suited for the burners. Our Fuel Oil Pumping and Heating Units are the result of years of experience. They come completely equipped ready for steam, exhaust, condensate, oil suction, oil return, and electrical connections. All valves, regulators, etc., are readily accessible. The piping arrangement is easily understood. These compact, space-saving units are available in a range of sizes and models in both Medium and High Pressure types. For complete details, write for our Bulletin 40 — very interesting and informative.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
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DUAL STAGE, Combining Steam and Mechanical Atomization
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
FUEL OIL PUMPING and HEATING UNITS
FURNACE RELIEF DOORS
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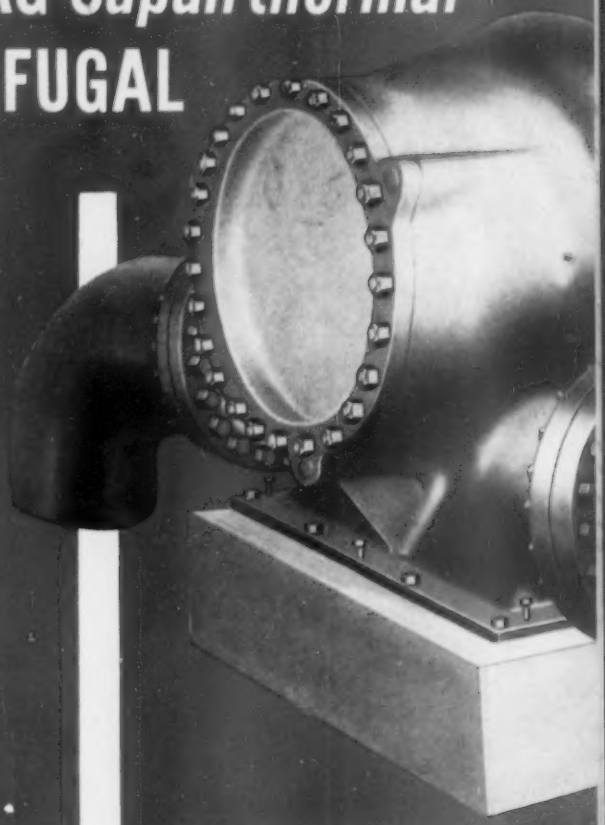
SPECIAL REFRACTORY SHAPES

NATIONAL AIROIL BURNER CO., INC.

1236 EAST SEDGLEY AVE., PHILADELPHIA 34, PA.
Southwestern Division: 2512 South Boulevard, Houston 6, Texas

Presenting the NORDBERG *Supairthermal*® ENGINE-DRIVEN CENTRIFUGAL COMPRESSOR UNIT

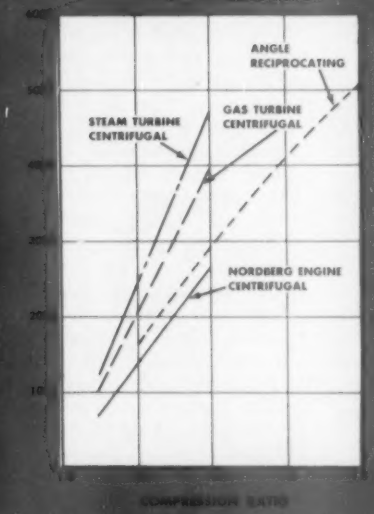
for Maximum Economy in GAS PIPE LINE SERVICE



• Nordberg Mfg. Co., pioneer builder of internal combustion engines, presents the latest development in compact, dependable power for maximum efficiency and economy in gas pipe line transmission service . . . *The Nordberg Supairthermal Engine-Driven Centrifugal Compressor Unit.*

Through use of exclusive design principles, the Nordberg *Supairthermal* spark-ignition gas engine operates at better than 40% thermal efficiency—with correspondingly lower fuel cost, increased horsepower, lower lube oil consumption, and lower maintenance costs per horsepower hour. The *Supairthermal* engine drives the compressor through a close-coupled speed increasing gear mounted on the bedplate extension of the engine. *Here, then, is an extremely compact, efficient engine-driven compressor unit which can be installed at low capital investment and operated at lower cost per horsepower than any other type of gas pipe line prime mover.*

With a complete range of engine types and sizes to choose from, backed by engineering experience second to none, it will pay you to consult Nordberg on specific power problems. *Call or write for full details, outlining your requirements.*



Savings of thousands of dollars per day in fuel costs on large gas pipe lines can be realized with the Nordberg engine-driven centrifugal gas compressor unit because, as the graph at the right shows, the Nordberg unit requires less fuel to compress gas than any other modern type of equipment of comparable capacity.

NORDBERG POWER CHIEF GAS ENGINES

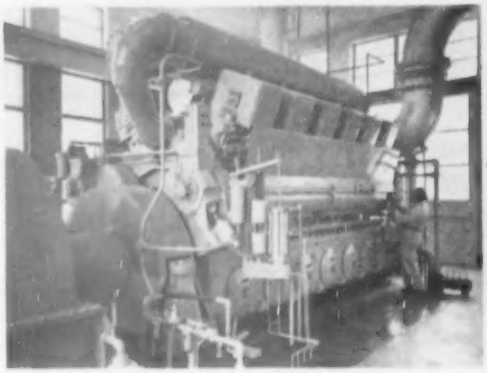
• NORDBERG *POWER CHIEF* Gas Engines are low cost, medium speed units, built for rugged oil field service. In jobs like production pumping and rig lighting, where "round-the-clock performance is a must, you'll find these sturdy *POWER CHIEF* units capable of delivering maximum power at minimum operating and maintenance cost.

Sold as power units, delivering 18 hp max., with clutch power take-off . . . and as "packaged" generator sets producing up to 10 kw.

POWER CHIEF units are also available for Diesel service in 1, 2 and 3 cylinder units, from 10 to 45 hp.

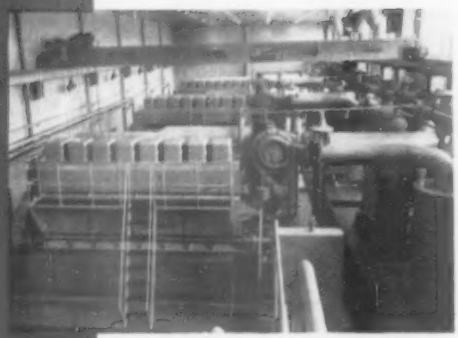
● Nordberg *Supairthermal* V-type spark-ignition gas engine driving a centrifugal gas compressor. V-type engines for this service are built in both 12- and 16-cylinder sizes, as well as in-line engines in sizes from 6 to 8 cylinders, offering a range from 500 to 5,000 horsepower per engine.

More and more Crude and Products Pipe Lines depend on Supairthermal® POWER



WOLVERINE PIPE LINE ➡

This compact, automatically-controlled Nordberg *Supairthermal* V-type Diesel engine furnishes all power for the Vicksburg, Mich., station on the Wolverine Pipe Line. Currently rated 2650 bhp, this engine will later be modified to develop 3200 bhp when additional line capacity is desired.

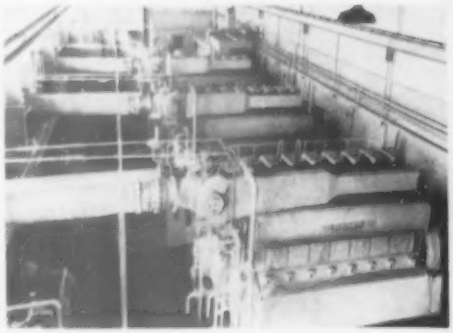


⬅ **LAKEHEAD PIPE LINE**

Twelve power-packed Nordberg *Supairthermal* engines will provide a total of 22,680 bhp for pumping stations along the Lakehead Pipe Line from the Canadian border to Superior, Wis., and from there to Sarnia, Ont.

TRANS MOUNTAIN PIPE LINE ➡

Twelve powerful, compact Nordberg *Supairthermal* engines totaling over 20,000 horsepower have been given the tough power assignment of supplying the "big push" over the Canadian Rockies of crude oil from Edmonton, Alta., to Vancouver, B.C., for the Trans Mountain Pipe Line Co., Ltd.



NORDBERG MFG. CO., Milwaukee, Wisconsin

Builders of America's Largest Line of Heavy Duty Engines—10 to over 10,000 Horsepower

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

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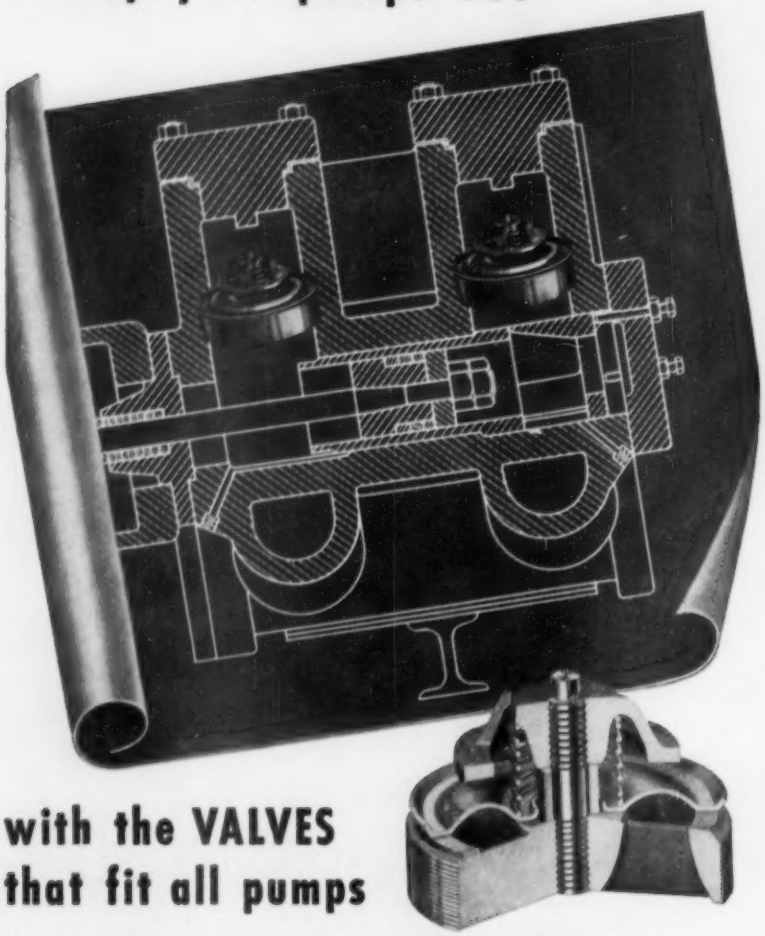
Keep your pumps FIT



with the VALVES that fit all pumps

Your old reciprocating pumps can be rehabilitated or adapted to new and severe service by fitting them with DURABLA Pump Valve Units.

The patented corrosion-resistant, non-warping, pressed metal valve, making only "point contact" on the stud or sleeve, cannot bind or hang up on the guard stem. The open-type guard assures free flow of liquid and eliminates any possibility of spring clogging from hardening liquids.

DURABLA Pump Valves will operate freely under extremes of high or low temperature, with highly corrosive fluids, and in any position. They will handle vacuums of one micron or discharge pressures of thousands of pounds per square inch.

Standard equipment on many pumps, DURABLA Valve Units are made in fifteen sizes, designed to meet over 300 variations in installation requirements. They will fit any reciprocating pump, new or old.

A DURABLA engineer will be glad to help you work out a plant survey covering your valve requirements. Write for bulletin or engineering assistance.

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son Stillman Fittings Division, H. K. Porter Co., Inc.; Sterling Electric Motors, Inc.; Bonney Forge & Tool Works; Black & Decker Manufacturing Co.; and Rochester Manufacturing Co.

Detroit Diesel Appoints Western Kansas Distributor

W. R. BAYS

W. R. Bays, former Kansas sales representative of Detroit Diesel Engine Division of General Motors Corp., has been appointed distributor for G. M. diesel engines in western Kansas.

The new distributor has taken over the facilities of Detroit Diesel's former distributor, Diesel Equipment Co. of Wichita and Great Bend, Kans., and the business will continue at the same locations under the same firm name.

Prior to taking over the new enterprise, Bays served Detroit Diesel both as service and sales representative. He was assigned to the Kansas territory in 1949. C. J. Davy, previously sales representative for the division in a southeastern zone, temporarily will handle the zones sales representative's assignment in this area.

Bays, president of the new company, has announced the following appointments: William Bennett, general manager; William Daniels, sales manager; Robert Abbott, service manager; and C. W. Hamilton, parts manager. All of them were employes of the former distributor.

Davis Opens New Power Equipment Firm At Dallas

A new distributorship for International Harvester industrial engines was opened in Dallas on November 1, by H. A. Davis. The H. A. Davis Power Equipment Co. will wholesale gas, gasoline, butane, and diesel engines in the industrial power-unit form throughout the North Central Texas area.

Davis has been associated with service, design, application, and sales of oil-field, aircraft, and industrial machinery for 18 years. He has spent 5 years with Oil Well Supply Co. and 3 years with Douglas Aircraft Co. For the past 10 years he has been district manager and application engineer for

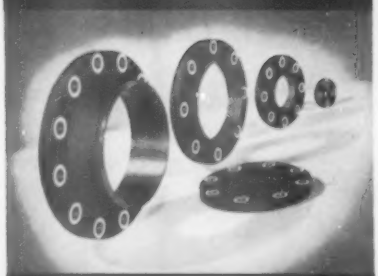
HALLMARK OF

Quality

IN PIPE COUPLINGS
AND PIPE FLANGES

Made to A.P.I. and A.S.T. Specifications

HARRISBURG SEAMLESS
STEEL PIPE COUPLINGS



Manufactured to A.S.A. Standards

HARRISBURG DROP-FORGED
STEEL PIPE FLANGES

CONTACT THESE DISTRIBUTORS

HOUSTON
Henry H. Paris, Distributor, Inc.
TULSA
W. C. Norris, Manufacturer, Inc. (Couplings)
TULSA
Ardun Supply Company (Flanges)

HSC-PP-2/54

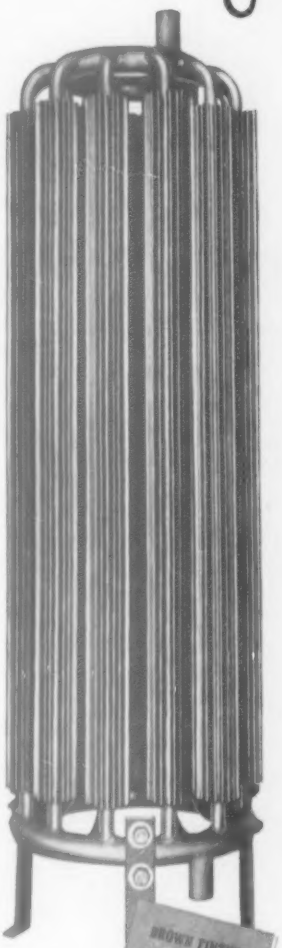
101 YEARS IN PENNSYLVANIA'S CAPITAL

Harrisburg Steel
CORPORATION

HARRISBURG 6, PENNSYLVANIA

4 reasons why

BROWN FINTUBE TF-18 TANK HEATERS HAVE OBSOLETED OLD FASHIONED TANK COILS



1) **LOWER COST**—Users report that the cost of TF Heaters plus their installation is usually less than the cost of just installing bare pipe coils of equivalent capacity.

2) **VERTICAL MOUNTING**—on legs about 10" above the tank floor brings the entire heating surface in contact with the tank contents—avoids heating through a layer of sediment.

3) **MUCH INCREASED EFFICIENCY**—Finned construction provides approximately 7 times more heating surface per foot of tube length than plain bare pipe—permits more heat to be transferred—faster—at lower temperatures per square foot of surface, avoiding coking or damage to heat sensitive products.

4) **EASY INSTALLATION**—TF-18 heaters pass easily through a standard manhole permitting installation in new or existing tanks. They do not require welding inside the tank. Manifolded into groups or individually trapped.

You can't keep your operations competitive with old fashioned, obsolete methods. Write today. Get full details about these new, fully proved, less costly, more efficient tank heaters.

New fully descriptive Bulletin No. 541 gives dimensions and full details. Write for your copy today.

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CHICAGO • ST. PAUL • ST. LOUIS • KANSAS CITY • MEMPHIS • BIRMINGHAM • NEW ORLEANS
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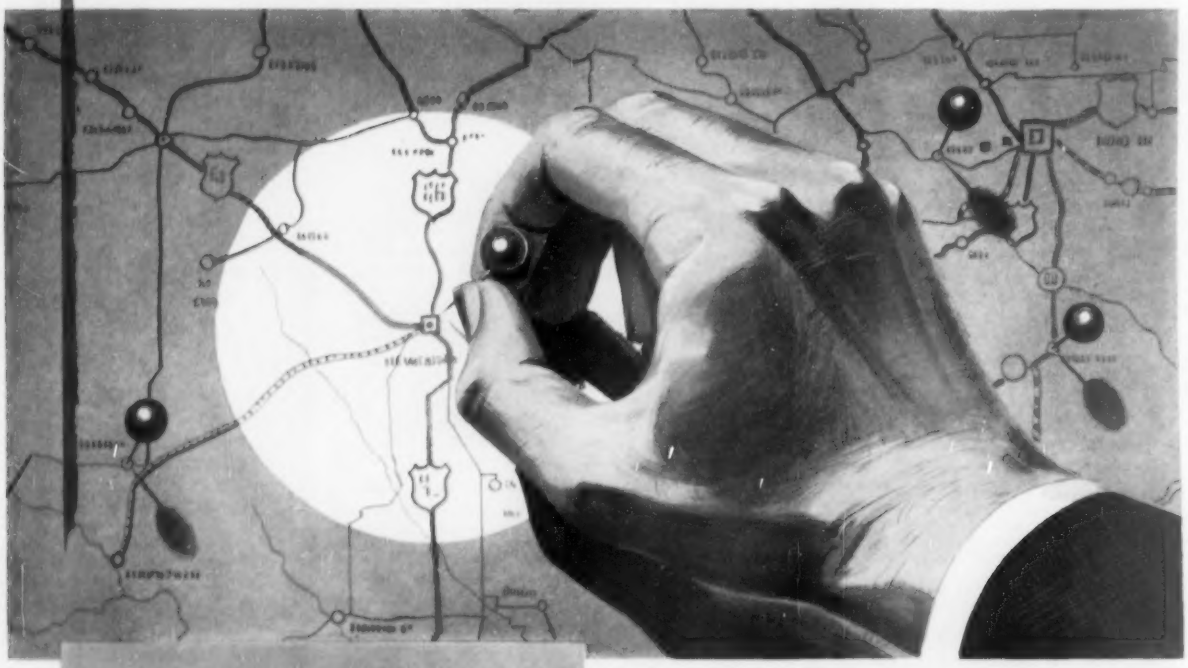
BROWN FINTUBE (GREAT BRITAIN) LTD., BIRMINGHAM, ENGLAND
FRIEDRICH UHDE, GMBH, DORTMUND, GERMANY

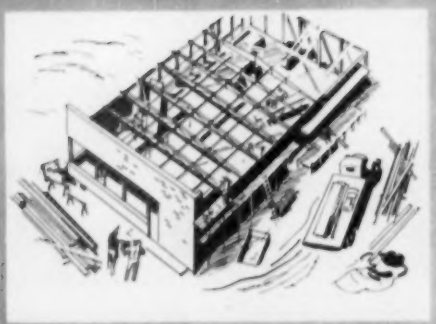
A storepoint is more than just a pinpoint

Each year dozens of additional supply store locations are established as a result of the oil industry's need for stock points in new areas. And each time this process is repeated, manufacturers who sell through these outlets gain a new sales force that has been maneuvered into . . . and carefully calculated to be strategically located . . . near the heart of new oil activity. On the part of supply store management, it takes foresight. It takes courage. It takes confidence. It takes capital.

Further, it takes every bit as much imagination and initiative as a competitive industry can muster. But whatever it takes, oil industry manufacturers and oil operators alike are the winners . . . because each profits by the benefits provided by the supply store industry.



There are now more than 900 supply store locations throughout the United States and Canada. It's sound business to buy and sell through these convenient outlets



LARKIN

...Through Your Supply Store

LARKIN PACKER COMPANY, INC. • ST. LOUIS, MO.

Twin Disc Clutch Co. in the Southwest.

The new company will serve oil fields in a 47-county trade area. In addition to complete engines, the firm will stock the full line of International Harvester power-unit repair parts and furnish field or shop service.

Rockwell Reorganizes Midwest Sales Staff

C. K. MADISON

Rockwell Manufacturing Co.'s Meter and Valve Division is reorganizing its midwestern sales setup to provide for increased service to customers throughout that section, L. A. Dixon, Jr., vice president, has announced. Carl K. Madison, midwestern regional manager, has been promoted to vice president in charge of new-product sales for the entire division, and the midwestern sales region has been divided into two new regions, a southwestern and a smaller midwestern region.

Roy R. Bush, Tulsa district manager, has been named midwestern regional

R. R. BUSH

McLAUGHLIN

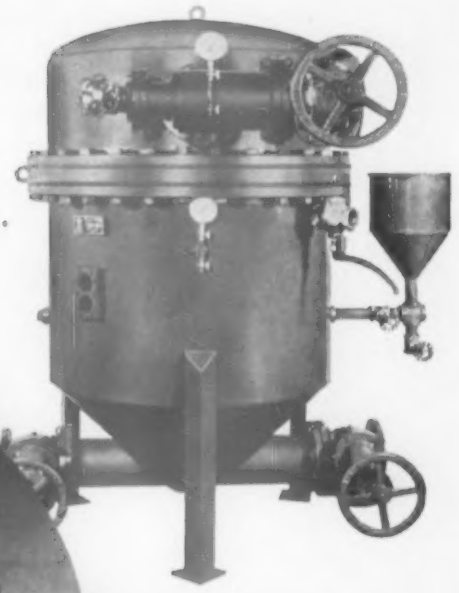
manager with headquarters at Tulsa; and W. R. McLaughlin, manager of the Dallas office, has become southwestern regional manager with headquarters at Dallas.

Madison joined Rockwell in 1929 as sales engineer in the Houston district, after 10 years' employment with Sinclair Refining Co. in various engineering capacities. He became Houston district manager in 1944 and was promoted to midwestern regional manager in 1951.

Bush joined the Rockwell sales staff in the Tulsa area in 1934. He became special sales representative for Nordstrom Valve Division later, and was appointed sales manager of oil-field products in 1951, with headquarters in Pittsburgh. In 1952 he returned to Tulsa as district manager.

McLaughlin joined the company in 1934 as sales engineer in Dallas, and later served as sales manager of the gas division in Pittsburgh and special sales representative in the southern

this small filter...



MAKES TOUGH JOBS EASY!

Stellar® *filter*

SMALL in size and operating cost, this Stellar Filter is BIG in results and efficiency. It saves up to 75% in space and up to 90% in weight. No coagulants are used. Operation may be by unskilled personnel.

The heart of the Stellar is the Air-Bump feature which keeps the Filter clean. No wasteful back washing is required for many applications.

Oil men are using the Stellar Filter for—

★ Filtration of water or brine for flooding, repressuring or disposal purposes.

★ Filtration of cooling water and recirculating process water.

★ Removal of ferrous sulphide and other impurities from monoethanolamine in natural gas purification.

INFILCO INC. | *Tucson, Arizona*

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Plants in Chicago and Joliet, Illinois

FIELD OFFICES IN 35 PRINCIPAL CITIES IN THE U. S., CANADA AND MEXICO

For more information on how the Stellar Filter can work for you, use coupon to the right.

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Please send your illustrated Stellar Filter Bulletin No. 1560-O.

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TITLE_____

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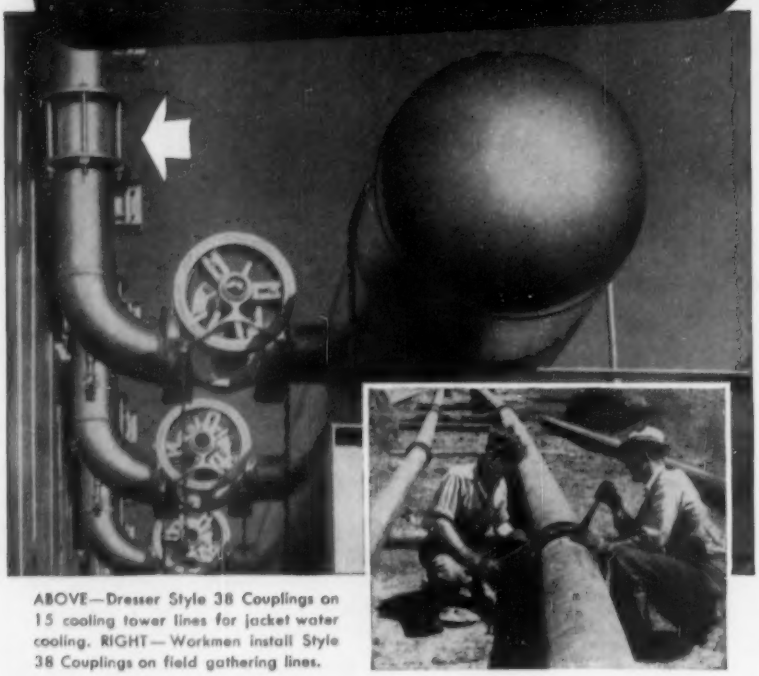
CITY_____ STATE_____

around a cooling tower...
the DRESSER way
is easier...surer!



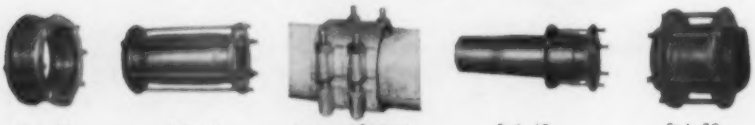
ABOVE—Dresser Style 38 Couplings on 15 cooling tower lines for jacket water cooling. RIGHT—Workmen install Style 38 Couplings on field gathering lines.

Anywhere you're joining pipe, the handiest, surest way to get bottle-tight joints is with Dresser Couplings or Long Sleeves.

Dresser Couplings provide the "give and take" necessary to absorb vibration, settlement and other stresses. Specially compounded rubber gaskets permit up to 4° deflection at joints—yet with Dresser Couplings, these joints stay permanently tight.

The only tool you need is a wrench—no pipe threading is necessary. Any workman can install Dresser Couplings, averaging only two man-minutes per bolt.

AVAILABLE AT LEADING OILFIELD SUPPLY STORES



Style 38 Coupling | Style 40 Long Sleeve | Hydrepair* Asbestos Cement Pipe Clamp | Style 63 Expansion Joint | Style 39 Insulating Coupling

*HYDREPAIR is a trade-mark of Dresser Manufacturing Division

DRESSER® COUPLINGS

Dresser Manufacturing Division, 49 Fisher Ave., Bradford, Pa. (One of the Dresser Industries).
Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Airport Blvd., S. San Francisco, Calif.

region. In 1952 he was designated manager of the Dallas office.

Thornhill-Craver Adds Battles To Sales Staff

R. S. (Bob) Battles has been added to the sales staff of Thornhill-Craver Co., Houston. He will serve Oklahoma and Kansas with his headquarters in Pauls Valley, Okla.

Battles has gained wide experience in drilling and producing problems in both Oklahoma and Kansas, while representing one of the larger supply companies in the area and serving as a supply-store manager in Kansas.

Howerth To Head Gar Wood Winch and Crane Sales

H. J. HOWERTH

Gar Wood Industries, Wayne, Mich., has appointed H. J. Howerth product-sales manager for Gar Wood truck winches and cranes, according to an announcement by E. B. Hill, vice president, sales. Howerth will be responsible for the development of a new sales program in the truck-winch field. Gar Wood manufactures truck winches with pulling capacities from 7,000 to 100,000 lb.

Howerth has been assistant sales manager of Gar Wood hydraulic hoists and dump bodies since 1953. He started with Gar Wood in 1946 as sales engineer and advanced to chief sales engineer of Gar Wood truck equipment in 1948.

Lane-Wells Makes Key Changes in Gulf Coast

Lane-Wells Co. has announced the following supervisory changes in the Gulf Coast division.

T. W. Lindsey, formerly subdistrict superintendent at Victoria, Tex., has been transferred to Hobbs, N. M., as subdistrict superintendent. G. K. Chandler, previously station superintendent at Falfurrias, Tex., has been appointed subdistrict superintendent at Victoria.

J. W. Maurice, formerly subdistrict superintendent at Hobbs, has been transferred to Falfurrias as station su-

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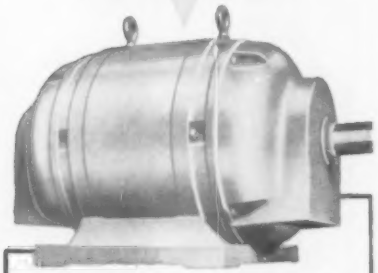

In the field you can depend on FIELDMASTER Ball Bearing Motors because they're **specially** built to meet the exacting demands of oil country use. Below are just five of the many **outstanding advantages** that make FIELDMASTER Ball Bearing Motors unsurpassed in their field!

1. Vermin Proof!

No matter how small, rodents and other animals can't get inside a FIELDMASTER Motor.

2. Drip Proof!

Special splash proof construction prevents damage to the motor from liquids and flying particles.

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Motor windings are specially treated for outdoor service . . . conduit box is moisture proof and dust tight.

4. Corrosion Resistant!

Weather-protected FIELDMASTER Motors can be used in any kind of weather — rain, snow, sleet, blowing sand and dust.

5. Forced Air Cooled!

This **exclusive** fan-cooling system provides cooler operation over **longer** periods of time.

May we ask our distributor, **BETHLEHEM SUPPLY COMPANY**, to contact you?

VALLEY ELECTRIC CORP.

4221 FOREST PARK BLVD., ST. LOUIS, MO.

NOW... WILLSON INTERCHANGEABLE RESPIRATORS

IN BOTH SINGLE AND DOUBLE CARTRIDGE STYLES!

Single-Cartridge Series 400

NOTE: The cartridges and filter shown for use in the Series 400 single-cartridge respirator are exactly the same as those used in the Series 800 double-cartridge respirator and can be used interchangeably in both. The other five cartridges, filters, and combinations are recommended for use only in the Series 800 respirator.

No. 441
No. 442
No. 443
No. 860
#441 Cartridge for Organic Vapors (BM230)
#442 Cartridge for Acid Gases
#443 Cartridge for Organic Vapors and Acid Gases
(BM216) #8415 Filter for Dusts and Mists (BM216)
#441 Cartridge and #8415 Filter for Dusts and Organic Vapors (BM230)
#441 Cartridge and #8477 Filter for Paint Spray
#444 Cartridge for Ammonia
#8361 Filter for Metal Fumes, Dusts and Mists (BM214)
#8436 Filter for Radioactive and Beryllium Dusts, Mists or Fumes
No. 841
No. 841P
No. 842
No. 844
No. 860A
No. 850
No. 850

Double-Cartridge Series 800

These Willson Respirators are the first truly interchangeable types in the field. Neither style requires additional parts or accessories to make use of the cartridges, filters, or combinations indicated to be used with them.

Write for bulletins describing these new Willson Interchangeable Respirators. Standardizing on them will give you the respiratory protection you want and simplify your inventory as well.

More than 300 Safety Products Carry This Famous Trademark

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Established 1870

WILLSON PRODUCTS, INC., 204 Washington Street, Reading, Pennsylvania

Step up
SPEED
THREADING ½" to 4" PIPE
Bring down Costs!

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★ *Threads 2" pipe in 18 seconds,* 3" in 30, 4" in 42.

★ *Cuts off 4" pipe in 9 seconds* with 4 high speed steel cutter knives, scroll fed.

★ *Instant size change . . .* separate quick-opening die head for each size pipe.

★ *High production . . .* performance proved! Order through your supply house.

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PIPE TOOLS . . .
PIPE WRENCHES . . .
POWER DRIVES . . .
POWER PIPE MACHINES

TOLEDO PIPE THREADING MACHINE CO.
Toledo, Ohio

perintendent. R. H. Ault, operator-in-charge of Pleasanton, Tex., has been reclassified station superintendent there.

Key Co. Appoints Burkhart Cleveland District Manager

R. D. BURKHART

The appointment of Robert D. Burkhart as manager of Key Co.'s Cleveland district office has recently been announced by B. J. Gross, president of Key Co.

Burkhart started with Key Co. in 1934, and his background of experience includes plant operations, engineering, refinery-equipment sales, and reconditioning service.

As manager of Key's Cleveland office, Burkhart succeeds Wm. P. Clary, who recently resigned.

Fansler Joins Blackmer As Division Manager

John D. Fansler has joined Blackmer Pump Co. as manager of its North Central division. With offices in Chicago, the division includes Illinois, Indiana, Wisconsin, Iowa, Missouri, Minnesota, Nebraska, North Dakota, and South Dakota.

Dunham Opens New Tank Plant At Minden, La.

Dunham Tanks, Minden, La., has recently announced plant facilities for the manufacture and installation of tanks for the oil industry. Dunham is managed by Sam Wilson and other experienced personnel who have worked in the tank industry for many years.

Dunham's Minden plant is equipped with modern tank machinery and tools. The plant is 290 ft. long and 125 ft. wide. Machinery includes automatic burning equipment, plate rolls, flanging machines, offset machine, shear, press breaks, multiple punch, and automatic welding machines.

Anderson-Dunham, Inc., the parent company, located at Baton Rouge, La., organized Dunham Tanks with the idea of supplying the oil industry with tanks manufactured and serviced by competent men who had many years of experience.

Dunham Tanks manufactures the

FOR DRILL COLLARS AND DRILL TUBING
JET-LUBE
MICRO 550 MIX
THREAD COMPOUND

- full makeup
- easier breakout
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- will not separate
- increases thread life
- corrosion and rust inhibitor
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Contains micro-ground moly-disulphide (MoS_2)

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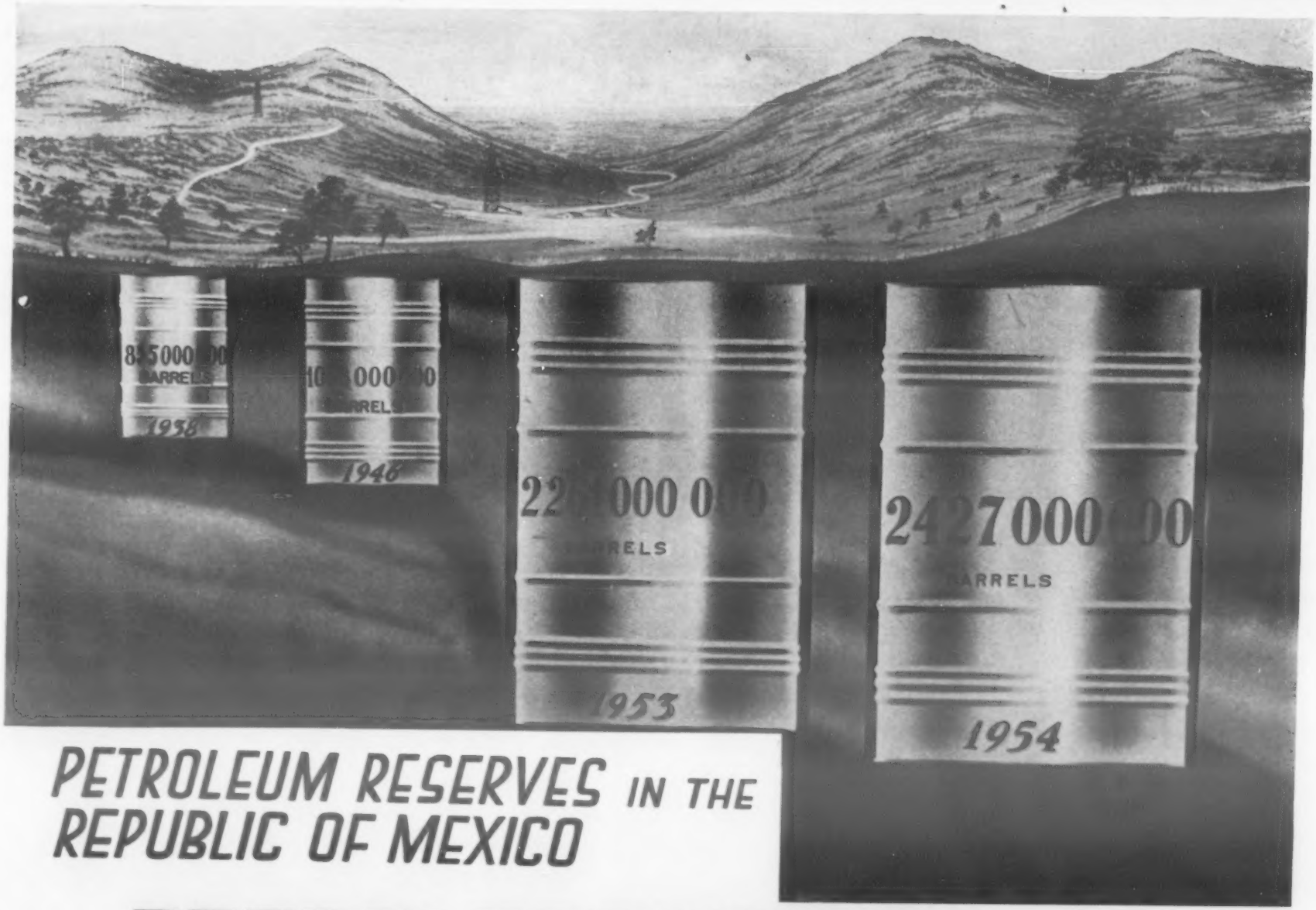

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Custom-Made for YOUR Job!

Electronically Weldforged and Bonderized for greater safety, strength and longer life, Kerrigan grating is custom fabricated to your exact requirements. Our large drafting staff is at your service to prepare drawings subject to your approval . . . and the finished grating comes to you well marked and identified for low cost installation.

Bearing bars, and cross bars alternating right and left for the utmost in safety, are weldforged into one piece, inseparable units. Write for your FREE copy of illustrated booklet as shown. It contains complete engineering data and shows how Kerrigan's *never-fail* weld stands up under the severest kind of punishment.

Write for FREE desk-size grating sample!

KERRIGAN IRON WORKS, Inc.

General Sales Office — 274 Madison Ave. — New York City

following products: bolted and welded steel tanks, stairways and walkways, oil and gas separators, scrubbers, emulsion treaters, emulsion heaters, indirect gas heaters, glycol gas dehydrators, dry-desiccant gas dehydrators, cold-separation units, free-water knockouts, and special pressure vessels.

Offices and stocking points are at: Shreveport and Lafayette, La.; Kilgore, Tex.; Seminole and Perry, Okla.; and Lester Moore Tank & Supply Co., Corpus Christi, Tex.

Sherwin-Williams Names Stetson to New Sales Post

Appointment of Glen A. Stetson as transportation sales and service representative for The Sherwin-Williams Co. in the greater Chicago area, has been announced by R. H. Hill, general manager of the firm's transportation sales division.

Stetson has been an assistant to Hill in the company's headquarters at Cleveland, Ohio since November 1950. In his new post, he succeeds Harry M. Faber, who is retiring after 47 years of service.

Assigned to the company's zone office, Stetson will work with A. V. Higgins, transportation zone manager. He will service users of Sherwin-Williams industrial finishes and various paint products in the railway, petroleum, chemical, steel, and marine fields. In addition, he will handle petroleum-paint needs in the Wichita, Kans., area.

New York Nomads See Australian Development

Fred Sealey, vice president in charge of production, and Don Eldridge, public-relations department, California-Texas Oil Co., presented a program consisting of a short talk by Sealey and two color-sound motion pictures. The program gave a complete verbal and visual history of the exploration and drilling operations, conducted in the Exmouth Gulf area of western Australia. Of particular interest were the logistic problems which had to be overcome in an area where there were no piers or shore facilities of any sort before No. 1 Rough Range was spudded in, September 5, 1953.

Hamer Announces Sales Organization Changes

R. H. STOCKTON

ANDREWS, SR.

ANDREWS, JR.

The Ralph H. Stockton Co. has been appointed exclusive sales agents for Hamer Valves in southern Texas. The announcement was made by Leland Hamer, president of Hamer Valves, Inc., Long Beach, Calif. Headed by Ralph Stockton, the new Hamer representative company will make its headquarters in Houston, Tex. Stockton was formerly with Keystone Tool Co.

The exclusive sales territory of Tom S. Andrews, Sr., has been expanded to include New Mexico, Arkansas, and Louisiana. Previously he represented Hamer only in Oklahoma, Kansas, and North Texas. Andrews, assisted in his selling chores by his son, Tom Andrews, Jr., for the past several years, will continue to maintain his headquarters in Oklahoma City. Branch selling offices have been established in Baton Rouge, New Orleans, and Lake Charles, La.

Chrysler Opens Los Angeles Industrial Engine Office

F. L. HARRIS

Opening of a completely staffed regional office to assist in promotion and sale of Chrysler industrial and marine engines in the Los Angeles area has been announced by Clyde C. Williams, general manager of Chrysler Corp. Marine and Industrial Engine Division.

Williams stated that establishment of the new office is in line with the company policy to open regional offices in any portion of the country where business warrants.

The office, which will be headquarters for Chrysler Marine and Industrial Engines on the West Coast, will

Sherman Power Diggers Make Small Jobs Profitable

Get all the advantages of power digging, even on smaller jobs where you can't afford to use heavy equipment.

Mounted on a rubber-tired tractor, the Sherman Power Digger makes a compact outfit that gets in and out of tight spots quickly and easily, moves from job to job at top tractor speeds.

It gets digging done in a fraction of the time and cost of manual labor. It digs as deep as 10′ below grade in mud, hardpan, gravel, shale or stony ground. Wide arc of swing allows ample reach for piling or loading. Instant fingertip control harnesses forces up to 10,000 pounds at shovel teeth.

The Sherman Power Digger is low in initial cost, economical to operate and maintain . . . often pays for itself on the first job. Write today for free descriptive bulletin No. 51AR.

Heavy, sticky "gumbo" mud presents no problem for the Sherman Digger.

The Sherman Power Digger operates in spots where bigger machines can't.

Designed, Engineered and Manufactured Jointly by
SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan
WAIN-ROY CORPORATION
Hubbardston, Mass.

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Other patents pending
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Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN

be located at Chrysler's California plant in Los Angeles.

Frank L. Harris, sales representative in the Chicago territory, has been selected to head the new office. R. H. Proctor, formerly sales representative in the Los Angeles area, has been assigned to other duties.

Atkinson Promoted to Parker District Manager

Promotion of J. H. (Jim) Atkinson, formerly Parker sales engineer in Houston, to district manager for the states of Texas, New Mexico, Louisiana, Arkansas, and Mississippi, also the advancement of Keith R. Detrich, formerly Parker sales engineer for Kansas, to district manager of Kansas, Oklahoma, Missouri, Iowa, and Nebraska, has been announced. Both of these were made by D. W. Holmes, sales vice-president of The Parker Appliance Co., Cleveland, Ohio.

Atkinson's representation will encompass Parker synthetic rubber O-rings, as well as Parker tube and hose fittings, and Parker industrial hydraulic components. Previous to joining Parker in 1953, he had been with O.T.M. Corp., and with Wilson Supply Co.

Detrich, popularly known as (Deacon), will devote his efforts to Parker synthetic rubber O-rings, as well as to Parker tube and hose fittings, and industrial hydraulic components. Previous to joining Parker in 1953, Detrich was connected with Standard Products, Inc., and before that with Boeing Airplane Co.

Norton Makes Cramer Refractories Engineer

Bruce Cramer has been appointed refractories engineer by Norton Co. for a new territory, consisting of the principal parts of Texas, Oklahoma, and Arkansas, as well as a small part of Louisiana. A graduate of Colgate University, Cramer first joined Norton in 1952. Prior to his present appointment, he was a member of the refractories sales-engineering department.

Denison Appoints Cordary As Houston Field Engineer

The appointment of Bruce J. Cordary as hydraulic field engineer in the Houston area, has been announced by Denison Engineering Co., Columbus, Ohio. Cordary has just completed an intensive hydraulic-engineering training program at the company's home offices and plant in Columbus. He was previously associated with Core Laboratory, Inc., and Houston Oil Field Material Co., Inc., both of Houston, as a field engineer.

Oilwell Names Hatcher As Store Manager

Appointment of Holland A. Hatcher as manager of the Arkansas City, Kans., store of U. S. Steel's Oil Well Supply Division, and of James A. Brunnemer to succeed him as field representative at that city, have been announced by Mark Barkhurst, manager of Oilwell's Mid-Continent area.

Hatcher joined Oilwell in 1945 after 3 years' oil field experience. He has held sales and managerial positions in Ellinwood and Russell, Kans., and has served as field representative at Arkansas City since July of this year.

Brunnemer was employed by Oilwell in 1946 and since that time has been located at Ellinwood, McPherson, and El Dorado, Kans.

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STURDYBILT
PREFABRICATED HOUSES

When you need employee housing take your choice of leasing or buying. STURDYBILT prefabricated residences, duplexes, and other buildings can be erected on your site, as you need them. You buy or lease, whichever you prefer.

In any case, select STURDYBILT. Investigate our lease or purchase plan for any type of housing you need.

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF CURTIS WOODWORK, JOHNS-MANVILLE BUILDING MATERIALS

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA.

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Do you have a Swabbing Problem?

let Guiberson equipment solve it with swabs designed to LIFT FLUID!

Special Cups for heavy loads, medium loads or light loads let you lift the most fluid in the shortest time... and save money.

A FULL RANGE OF SIZES

1" through 13 3/8"

Macaroni Strings • Regular Tubing

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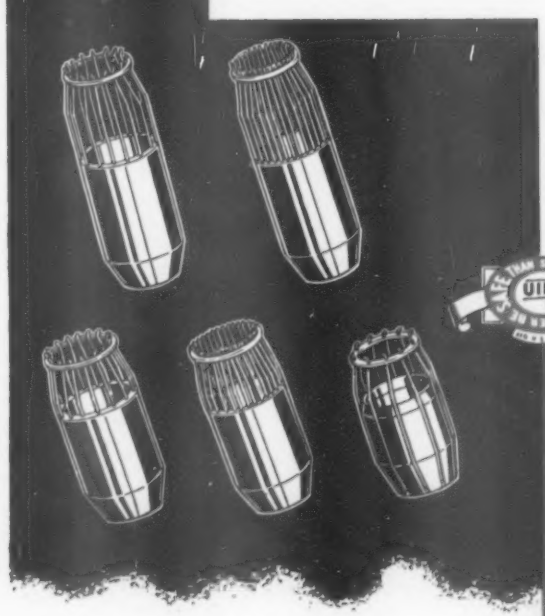
Drill Pipe • Line Pipe • Casing



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GUIBERSON

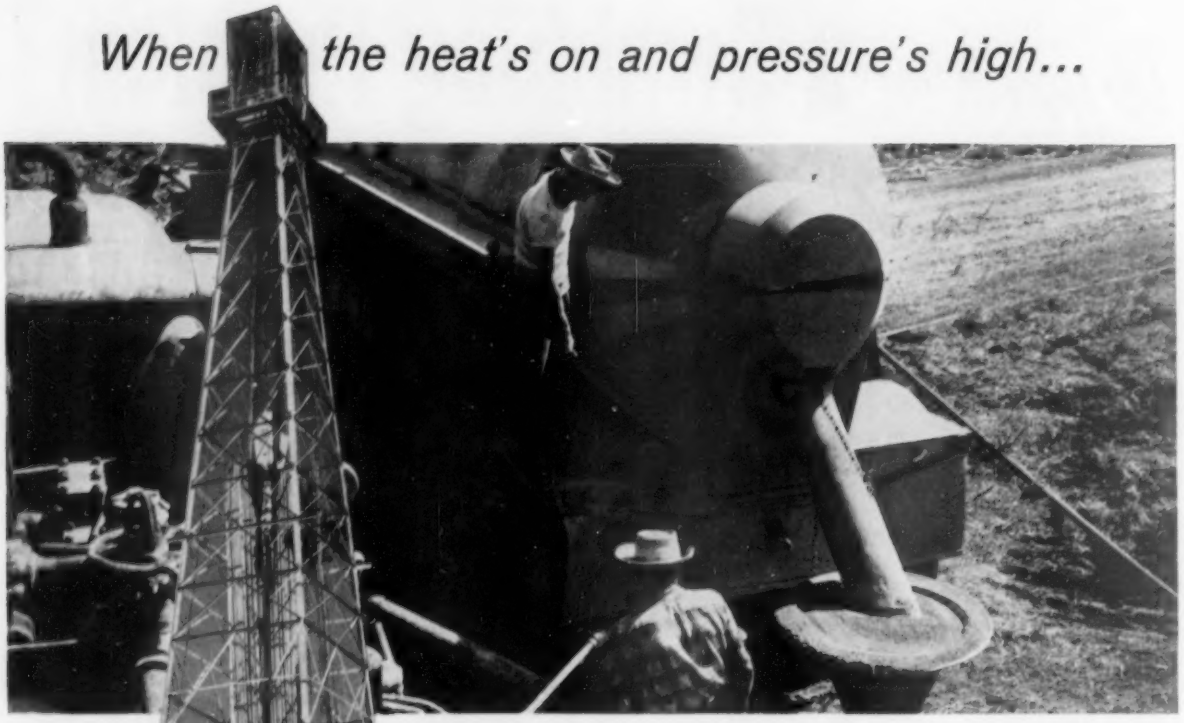
CORPORATION

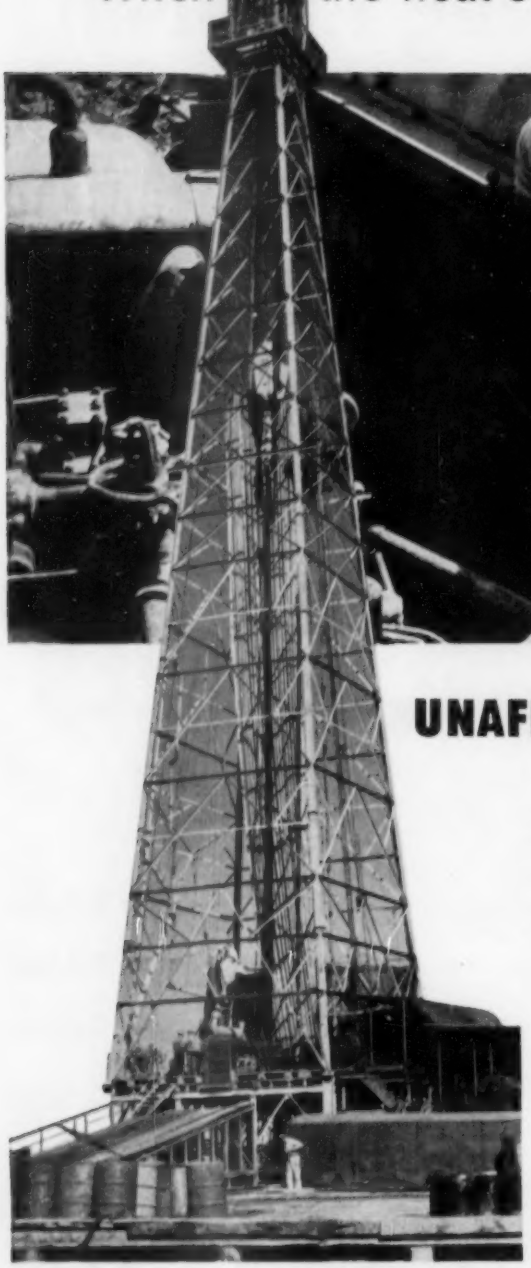
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

Guiberson's complete line of swab cups are molded in their *own* rubber plant. *Over 34 years' experience* serving the oil industry.

When the heat's on and pressure's high...





UNAFLO* safeguards your "stake"

These three properties of Unaflo provide added safety in hot, deep cementing jobs:

1. Sustained Fluidity – Unaflo has a retarded set . . . stays pumpable to provide vital extra time when emergencies arise.

2. High Initial Fluidity – Unaflo pumps easily from the start – stays fluid under high temperatures and pressures.

3. Strength and Durability – After the retardation period, Unaflo forms a strong, tight, sulphate-resistant seal.

When you're drilling deep and your cementing slurries must go in place without a hitch, despite heat, pressure or unexpected delays, Unaflo helps protect your investment. Specify Unaflo wherever a retarded cement is applicable.

For information and typical data tables on Unaflo's well-bottom performance or our other cements, write: Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y., or any of the sales offices below.

*"UNAFLO" is the registered trade-mark of the retarded oil-well cement manufactured by Universal Atlas Cement Company

MINNEAPOLIS • WACO • KANSAS CITY • BIRMINGHAM • CHICAGO • NEW YORK
Export Distributor: United States Steel Export Co., New York

Universal Atlas Cement Company

OIL-FIELD CEMENTS

Unaflo *Retarded* Oil-Well Cement
Resistant to Sulfate Waters
Atlas Portland Cement—Type I
Atlas Portland Cement—Type II
Resistant to Sulfate Waters
Atlas High-Early Cement—Type III

OG-U-131

UNITED STATES STEEL HOUR—Televised alternate weeks—See your newspaper for time and station.

EXPLORATION

North Park . . . Front Row Center Again

by John C. McCaslin

THE industry is wiping the dust off its maps of the intermontane North Park basin of northern Colorado again.

The first excitement since late 1952 in this small 1,500-sq.-mile basin is reported at a wildcat about 2 miles north of Continental Oil Co.'s North McCallum Unit in Jackson County. The new surprise for the area is Lion Oil Co. 1 Dwinell (arrowed on map). Lion swabbed at the rate of 32 bbl. of oil per hour for 3 hours through perforations at 4,654-64 ft. in the Lakota (Lower Cretaceous). Following the swab test the well was allowed to flow. It flowed at the rate of 7.6 bbl. per hour. The discovery is shut in for storage. Drill-stem test recovered oil from both the Dakota and Lakota with flow rates of about 7 bbl. per hour on tests of each of these zones. The oil was black and 32° gravity.

Seven dry holes . . . Last year's exploratory work in the North Park basin proved to be very disappointing. Jackson County's activity consisted of seven failures.

The last time the basin hit the news was October 1952 when Hiawatha Oil & Gas Co.'s Coalmont anticline wildcat seemed assured of Frontier (Upper Cretaceous) production. But by the end of the year production tests proved to be in vain and the wildcat was abandoned early in 1953, ending immediate hopes for production on the anticline, a surface-expressed structure. The Hiawatha wildcat flowed 42°-gravity oil at rates of at least 35 bbl. per hour on drill-stem test of the first Frontier. Carbon dioxide made up about 5 per cent of the volume of wet gas accompanying the oil flow.

Geologic sketch . . . North Park basin is crammed in between the Front and Park ranges of the Rocky Mountains. It covers an area approximately the same size as Jackson County.

The floor of the basin is high, having a ground elevation of 8,400 ft. above sea level. Its sediments are believed to attain a thickness of 14,000 ft., but 5,000 ft. of this is composed of freshwater Tertiary beds. Marine Cretaceous shales and sands make up most of the remaining known section. The rim of the basin is known to have Jurassic clastics and Triassic red beds. A thin Pennsylvanian limestone has been found resting on the basement in the northeast part of the basin. What lies below the Cretaceous in the deeper part of the basin in the way of Paleozoics is unknown.

One of the Rocky Mountains' most interesting and remote basins is the North Park. The small one-field basin, hemmed in on all sides by the Rockies, has added a new producing area.

The Section At North Park

TERTIARY
- **Wasatch**

UPPER CRETACEOUS
- **Eagle**
- **Pierre**
- **Frontier†**
- **Muddy**
- **Dakota***

LOWER CRETACEOUS
- **Cloverly**
- **Sunburst**
- **Cut Bank**
- **Lakota***

JURASSIC
- **Morrison***
- **Sundance**

***Produces at North and South McCallum fields. †Flowed oil at Coalmont anticline wildcat in 1952. Shows location of North Park basin pay zones in Rocky Mountain column.**

Production history . . . North Park has but one commercial field developed. North McCallum produces carbon dioxide gas and condensate from four Dakota-Lakota wells. This field has four Dakota-Lakota wells and one Morrison well shut in.

The field is located on a 17-mile-long structure, having known closures of 1,500 and 2,000 ft. Southeast of the North McCallum unit there is noncommercial production at South McCallum, located on another very steep and narrow anticline. Both fields were opened about 27 years ago. The McCallum anticlines are both on a single line of uplift.

Revival of the North Park basin activity began in 1951 when Continental conducted a seismic survey. Then in 1952 Continental opened Morrison (Jurassic) production at one North McCallum well. The deep-pay discovery was finaled for 234 bbl. of oil and more than 10 M.M.c.f. of carbon dioxide per day.

What now? . . . Geologically, the North Park basin is rather unattractive for oil possibilities. But the fact remains that there is one commercial field, one semi-proved area, and now a discovery in the basin. This means that the basin cannot be crossed off the list. The Lion discovery will undoubtedly revive the sleepy interest in the area of very little drilling.

The small basins of the country have been of considerable interest this year. The North Park is the third to get on the front pages in recent months. Just last month first oil production was officially opened in far northwestern Texas' Dalhart basin, an area of very little previous drilling. Continental is currently in the middle of a wildcat program in New Mexico's small Raton basin. Two important tests have been announced for Texas' Palo Duro basin, another remote area of no production. No wells have come in yet in the Raton and Palo Duro, but showings have been reported in the Raton activity. As is the case with the North Park basin, the drill is the key to these basins' potentialities.

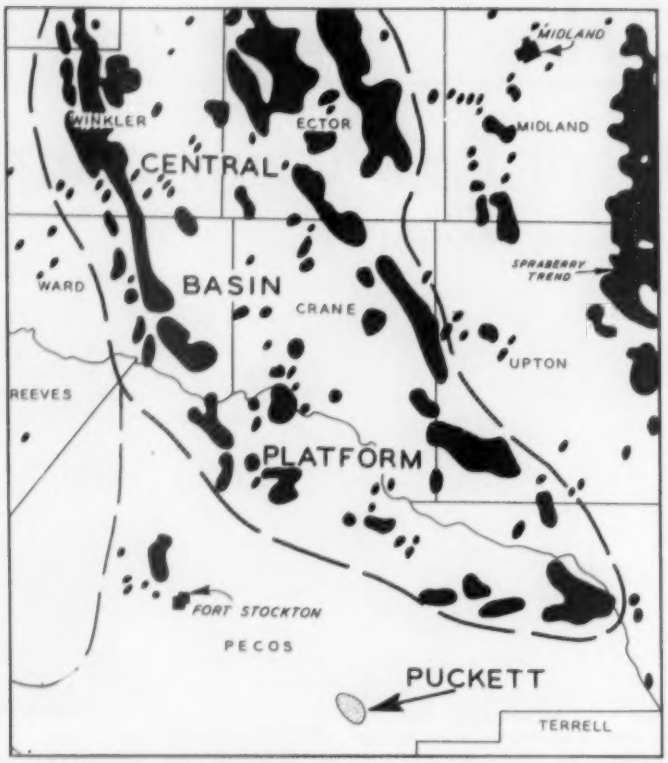


Fig. 1—Phillips Petroleum Co. is developing a large gas reserve at Puckett field in Pecos County, Texas. Production is from the Ellenburger formation, found below 12,000 ft.

Puckett Field Opens New Vistas in West Texas

by Norman S. Morrisey

PUCKETT field, in Pecos County, Texas, is anomalous because it is a tremendous anticline, discovered at a time when many geologists thought that all large structures had been found and when oil companies were trying to pin point low-relief structures covering less than a section.

Discovered in 1952 by Phillips Petroleum Co., Puckett covers over 7,000 acres with 11 gas wells and 3 dry holes. Although several large fields on the west side of the Central Basin platform produce gas or oil from the Ellenburger, Puckett stands alone, 27 miles from the nearest Ellenburger production (Fig. 1).

Geology . . . Puckett field is on the southwest flank of the Central Basin platform. A large regional gravity feature lies to the southwest of the field.

Although the field has not yet been defined, Puckett is a large anticline with at least 2,800 ft. of relief. One well on the west side of the field appears to have penetrated a major fault zone with about 450 ft. of section cut out. Subsurface data indicate that there is additional faulting along the west flank of the field and that the geology is complex in this area (Fig. 2). Although most wells in the field have cut minor faults, the distance between wells makes it impossible to trace these faults.

The Phillips 1 Puckett "G" was bottomed at 16,575 ft. without ever reaching the Ellenburger. At total depth the well on correlative points was more than 3,000 ft. lower that the Phillips 1-A Puckett "B" that was abandoned at 16,535 ft. in igneous rock. The 1-A Puckett apparently cut a normal fault above the Ellenburger and drilled a normal section below the fault. The field has been defined on the west side by dry holes (Fig. 3).

On the north, it is anyone's guess as to how far the field will extend. Optimistic contouring of subsurface data indicates that the formations are still rising and that no critical northwest dip has been logged (Fig. 3). An alternate interpretation can be made that shows the critical northwest dip on the basis of the 77 ft. of dip between the 1 Puckett "K" and the 1 "Evelyn Joe."

At the present time proved or semiproved production covers an area 4 miles long in a northwest - southeast direction by 3 miles wide in a northeast-southwest direction.

Since many large anticlines are bilaterally symmetrical, Puckett may eventually cover an area at least 8 miles long. As a matter of fact, on trends of this magnitude, production could extend for many miles both in a northwest and a southeast direction. Although the mechanics of origin may be different, Puckett resembles some of the large well-known geologic structures in size like Oklahoma City field. Puckett, however, has a major fault zone on the west side, whereas at Oklahoma City the main fault lies east of the producing area.

The reservoir . . . The Ellenburger at Puckett is 1,500 ft. thick and consists of porous and permeable fractured dolomitic limestones and dolomites interbedded with tight limestones.

The discovery well, the Phillips 1 "Glenna," is producing from 520 ft. of perforations in a limestone and dolomite interval 800 ft. thick. Examination of the electric log from this well reveals 310 ft. of MicroLog pay that occurs as thin permeable zones separated by nonpermeable streaks. Production appears to be closely related to the fracturing.

At the outcrop in the Marathon uplift, the Ellenburger equivalent is composed of limestones for the most part. These grade northeastward into the Ellenburger dolomites of the Llano uplift.

In many of the fields of the Central Basin platform, the Ellenburger production is controlled in part by minute fractures that probably were formed during folding. On the southeast end of the platform, however, the Ellenburger becomes more dolomitic with porous zones developed in the formation. In Oklahoma, the Royer dolomite member of the Arbuckle (Ellenburger equivalent) can be traced for over 100 miles. It is conceivable that similar dolomite zones in the Ellenburger of West Texas may cover a broad area.

This means that the Ellenburger is

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these Debentures. The offer is made only by the Prospectus.

$100,000,000

Continental Oil Company

Thirty Year Sinking Fund 3% Debentures

Dated November 1, 1954 *Due November 1, 1984*

Interest payable May 1 and November 1 in New York City.

Price 101¼% and Accrued Interest

Copies of the Prospectus may be obtained from only such of the undersigned as may legally offer these Debentures in compliance with the securities laws of the respective States.

MORGAN STANLEY & CO.

BLYTH & CO., INC. **THE FIRST BOSTON CORPORATION** **GOLDMAN, SACHS & CO.**

HARRIMAN RIPLEY & CO. Incorporated **KIDDER, PEABODY & CO.** **LAZARD FRERES & CO.**

LEHMAN BROTHERS **SMITH, BARNEY & CO.** **F. S. SMITHERS & CO.**

STONE & WEBSTER SECURITIES CORPORATION **UNION SECURITIES CORPORATION**

WHITE, WELD & CO. **DREXEL & CO.** **SALOMON BROS. & HUTZLER**

October 28, 1954.

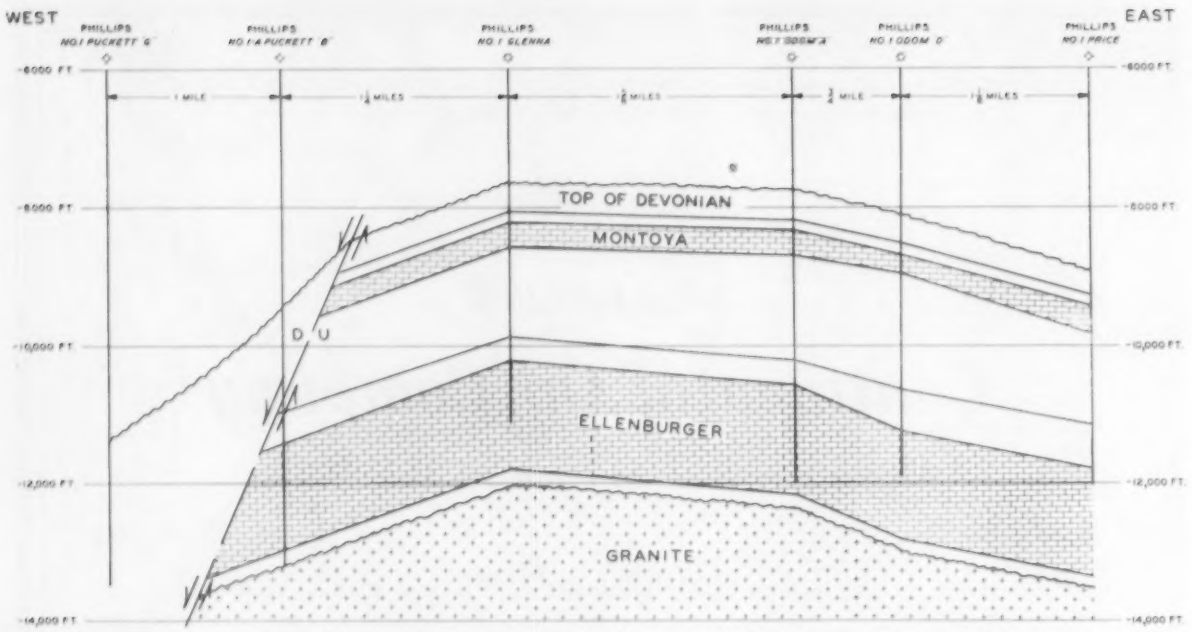


Fig. 2—Simplified east-west cross-section through Puckett shows a large anticline with a major fault zone along the west side of the field.

a potential reservoir under a vast area west of the Llano uplift and southeast of the known Ellenburger producing areas of the Central Basin platform.

The Ellenburger at Puckett is overlain by a normal Simpson section. Although the Ellenburger porosity in some fields is caused by erosion, the presence of the overlying Simpson and Montoya beds appear to rule out this possibility.

Source of the Ellenburger gas is still a moot question. Although some geologists consider the Simpson formation as the source, it is more probable that the oil is indigenous; in short, Ellenburger oil or gas originated within the Ellenburger formation. This is substantiated by the presence of hydrocarbons that often cover Arbuckle (Ellenburger) insoluble residues. Although on a percentage basis, the amount of indigenous hydrocarbons is small, it is ample to form the source of oil or gas for a sizable accumulation in a given area.

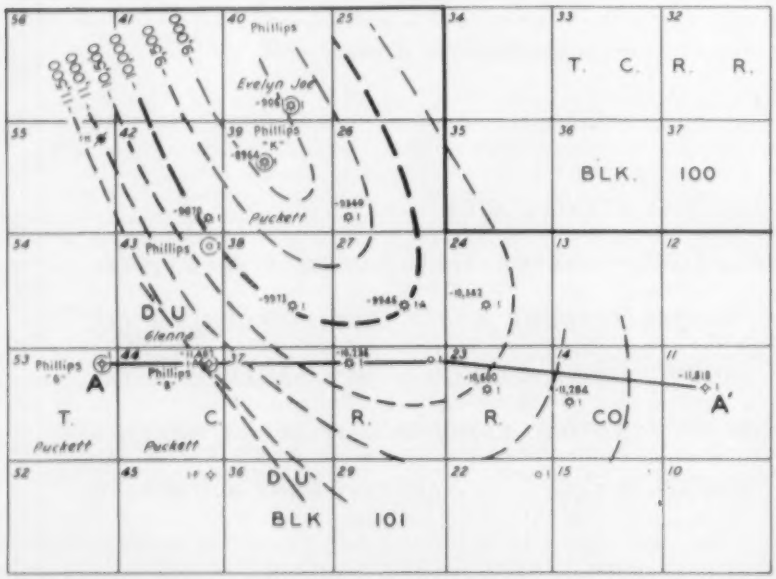


Fig. 3—Puckett is a major structural feature with over 2,800 ft. of relief between the highest and lowest wells in the field. Minor faulting is not shown on the above map. (Base map courtesy Southwest Mapping Co., Fort Worth)

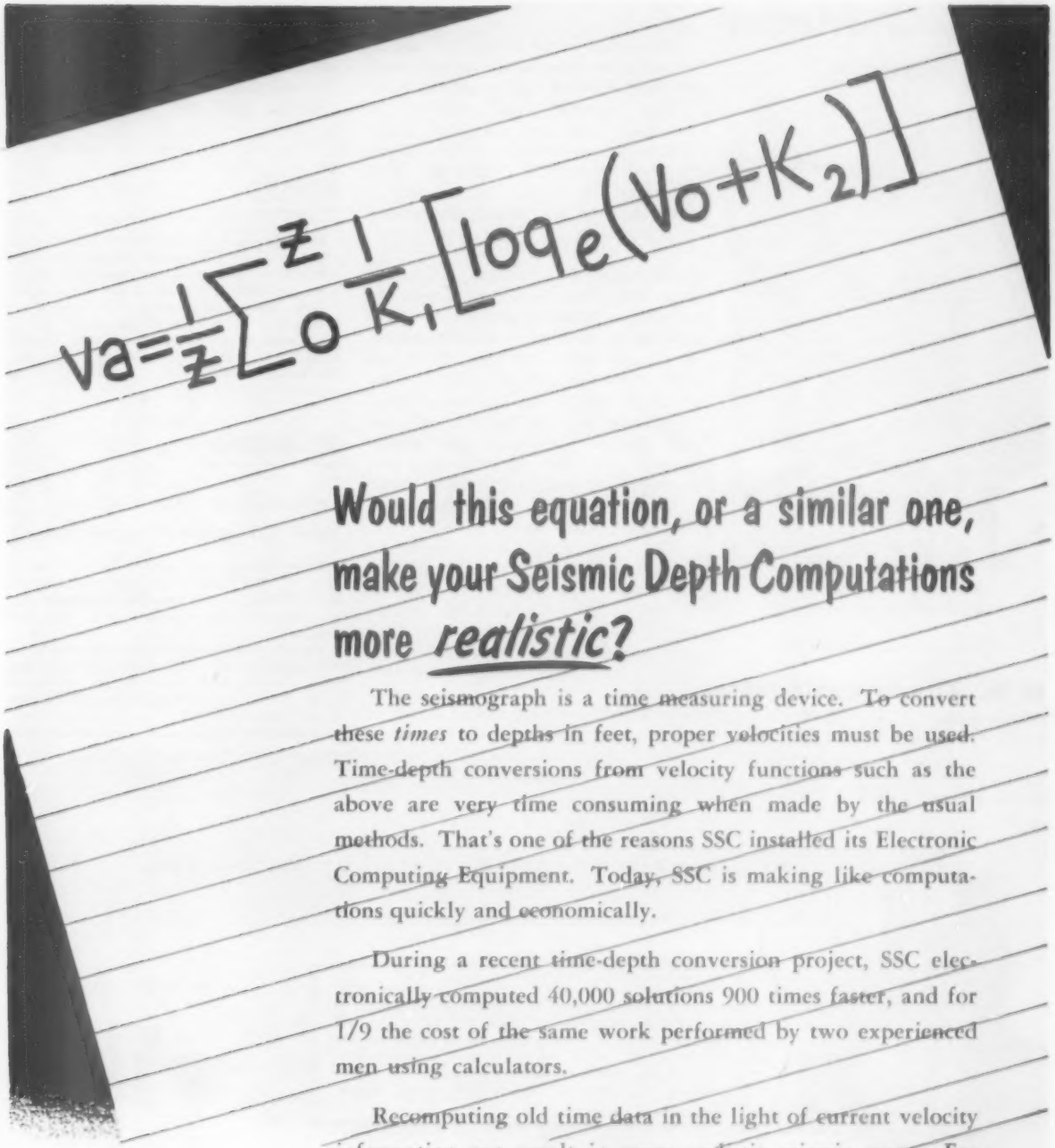
Several wells on the northeast flank of the field are indicated gas producers in the Siluro-Devonian section. This production is controlled in part by stratigraphy, as the zone appears to be missing in wells on the southwest flank of the structure. The Puckett 1-H produced for a short time from the Pennsylvanian, but has been abandoned.

Ellenburger gas . . . Puckett field currently is producing about 35 million cubic feet of gas per day. Wells are completed for high initial potentials ranging from 13,000 to 45,000 M.c.f. of gas per day.

The gas has a heating value of only 725 B.t.u. per cu. ft. at the well head because of the high CO_2 content that runs to 30 per cent by volume. The gas is processed by Permian Basin Pipeline Co.'s plant where the CO_2 is removed and enters the pipeline with a B.t.u. content of 1,030.

A study of the processing plant's ultimate capacity affords a clue as to the estimated output of Puckett field. The plant is now handling 34.8 M.c.f. of gas daily, but can eventually process three times that amount. These figures indicate that the output of the producing area will increase considerably by the time the field is finally outlined. This conclusion is substantiated by geological information.

Drilling and completions . . . Wells are completed in the open hole or through perforations. Phillips normally acidizes prior to finaling the well with treat-



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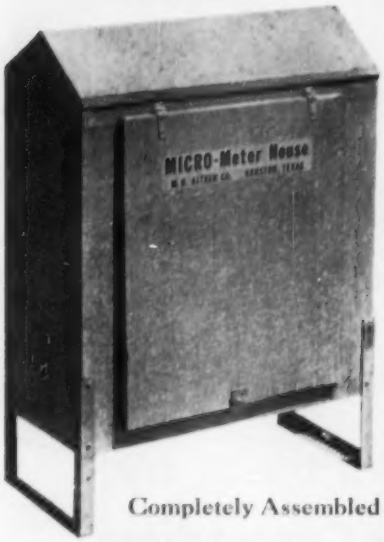

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ments ranging from 1,000 to 10,000 gal.

Three strings of casing are usually set, with the intermediate or salt string at about 5,200 ft. to protect the hole.

The discovery well required 18 months to drill and complete. Since then some field wells have been drilled in about 5 months to 13,800 ft. These are exceptions because the majority of wells required 8-12 months from spud to completion.

Significance of Puckett . . . Although little has been published about the regional subsurface geology of Pecos County, it is probable that Puckett is on a major geological trend. Structures with 2,000-3,000 ft. of relief are unusual in today's exploration geology. Experience in other areas shows that this type of production just doesn't happen and where there is one producing field, more are usually found.

Oil and gas fields are like bananas—they come in bunches.

The origin of the forces that formed Puckett remains to be solved. Normal faulting on the west side of the field indicates tension, probably accompanied by uplift; the relatively sharp fold points to compression. Additional subsurface control may settle the problem.

The fact remains that Puckett is developing into an important gas field. It has opened a vast new area for the exploration geologist where both large structures and thick porous reservoirs are considered to exist.

Where will the next Puckett be found?

ILLINOIS

In Effingham County Partlow-Cochonour and Leo Light 1 Florence French, NW NW NW 34-7n-7e, 8 miles southeast of Effingham, swabbed 24 bbl. of oil per day natural.

The Cypress sand strike is 2 miles from production. It is one of the most prolific pay sands in the Illinois basin area. Smith Mills pool in Henderson County, Kentucky, has produced more than 10,000 bbl. of oil in the last 12 years.

OKLAHOMA

Toklan-Lone Star Test Well Completed In Stephens

Completion of an initial test well on a block of 340 acres owned jointly by Toklan Royalty Corp. and Lone Star Producing Co. in Stephens County, Oklahoma, was announced.

The new well has an initial production of approximately 75 bbl. daily, after having been plugged back from a total depth of 8,700 ft. to the Pickens sand encountered at 6,710 to 6,790 ft.

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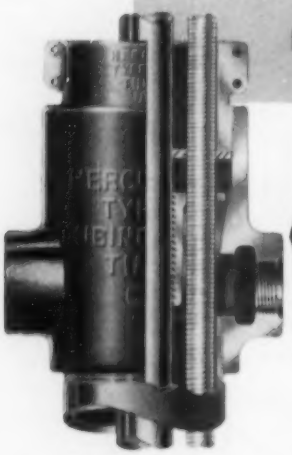

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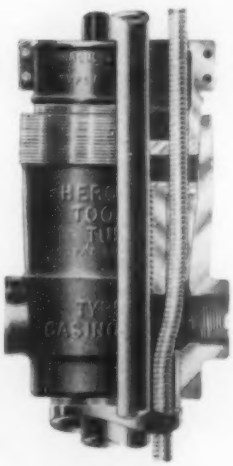
IN DEEP WELLS



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Marshall County Strike Tests Sixth Pay Zone

Sinclair Oil & Gas Co. et al 1 Griffin, SE NE NE 16-5s-5e, Marshall County multipay discovery, tested the third Bromide sand. The test found more than 20 ft. of porosity. The well flowed 3,020 M.c.f. of gas per day plus distillate. The second Bromide got 2,520 M.c.f. of gas per day plus 140 ft. of gas and distillate-cut mud and some free distillate at 5,975 to 6,015 ft. Other zones showing for production are the Springer, the first Bromide sand, and gas from the Sycamore and the Viola.

The new multipay discovery is located northwest of Madill and east-southeast of Ardmore in extreme southern Oklahoma. It is located in the Ardmore-Marietta basin. Nearest big production is Big Mineral Creek field in Grayson County, North Texas. Nearest Oklahoma production of importance is Cumberland field in northeastern Marshall County.

Good Oil Well Reported In Old Country Club Area

Tulsa County's old Country Club pool area, 6 miles north of the Tulsa Postoffice in NW NE NE 14-20n-12e, has a good oil well that is producing 15 bbl. per day.

It is E. E. Schonover 1 Harris. It tested 150 bbl. of 35°-gravity oil per day from Bartlesville sand at 1,202-62 ft.

New Logan County Gas Pool Opens In Layton

A big gas wildcat discovery well for Logan County has opened a new producing area in that central Oklahoma county.

It is Powell Briscoe, Inc. 1 Poteet, SW NE NE 11-15n-2w. It flowed an estimated 30,000 M.c.f. of gas per day natural on open flow test of perforations in the Layton sand at 4,586-96 ft. The discovery is 2 miles southeast of Logan's East Guthrie Lake field.

Cambrian Production?

Cambrian production is hinted at a well in a rank area of southeastern Muskogee County in eastern Oklahoma.

Leonard Brothers is drilling the wildcat near Gore in NE SE NE 5-11n-21e. The wildcat gave up free oil and gas from 4,418-24 ft. The zone tested is reportedly Cambrian. If this is true and the well is completed successfully it would be eastern Oklahoma's first such pay.

Grady Still Leads In State Developments

Southwestern Oklahoma's Grady County is currently out in front in exploratory and development activity. The county's two active areas are the Bradley and Chickasha sectors.

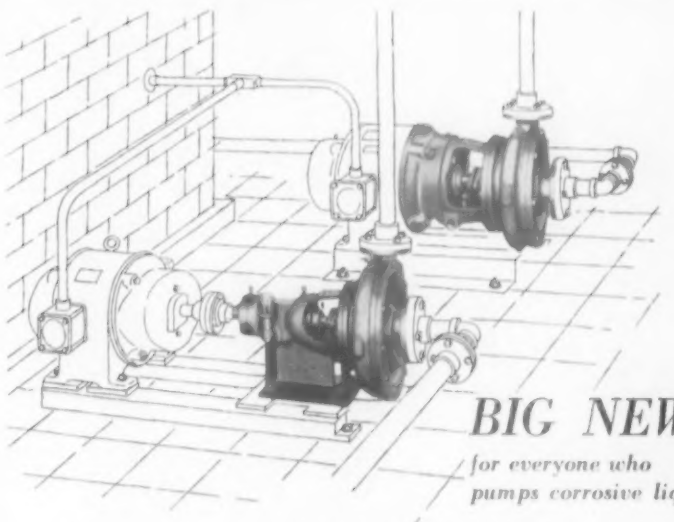
Phillips Petroleum Co. is taking production tests of Lower Ordovician zones at 1 Maxine in SW SE 26-5n-5w, extension try at Bradley townsite. Five separate pay zones have been perforated. From perforations at 13,620-76 ft. the flow reached 18 bbl. of oil in 4 hours on ½-in. choke.

Phillips 1 Nye in N ESE 34-5n-5w flowed 128 bbl. of oil in 24 hours on tests of Springer (Pennsylvanian) perforations. Magnolia Petroleum Co. 2 Marie Burkes in C NW SW 12-4n-5w, Southeast Bradley pool well, flowed 294 bbl. of oil in 24 hours through 18/64-in. choke in the Springer.

Chickasha area . . . Oklahoma Natural Gas Co. 4 School Land in Chickasha field flowed 140 bbl. of load oil and 153 bbl. of new oil in 13 hours through 1-in. choke to prove a new zone for the oil-producing area of the big gas field. Perforations were at 2,962-76 ft.

Atmar & Hodge 1 Cox, NE NW SE 14-4n-8w, has indicated success after tests of the interval 3,089-3,111 ft. Little Nick Oil Co. 1 Wood flowed 151 bbl. of load oil in 8 hours. Final testing awaits more storage space. Frankford Oil and Inland Oil Co. 1 Carver, NE NW NW 1-4n-8w, flowed 3,700 M c.f. of gas per day at 1,858-78 with some oil shows recovered at 2,312-38 and 2,675-82 ft.

B. B. Burke 5 Sanford, C SW SW 23-5n-8w, is a deep zone well in the field. It flowed



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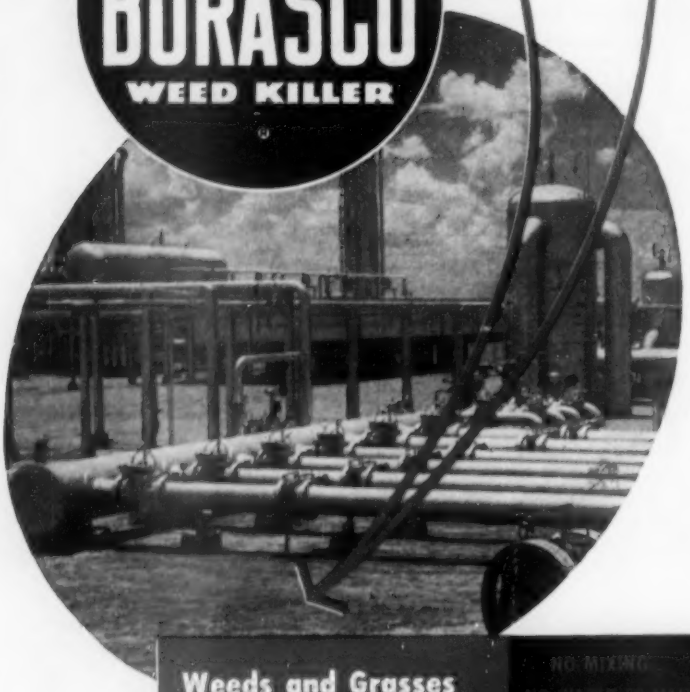

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12,000 M.c.f. of gas per day from Glover-4 sand at 5,164-94 and 5,208-38 ft. Oklahoma Natural 3 Duke Unit, NE NE SW 35-5n8w, showed gas with free oil on test at 3,015-44 ft.

TEXAS

WEST TEXAS

Multipay Discovery in Ward Flows Ellenburger Oil

British-American Oil Producing Co. 1 Tubb, located 9 miles southeast of Monahans, has indicated production from five separate pays, and at this writing had drilled 269 ft. into the Ellenburger after making 3 successful drill-stem tests in the latter formation.

Top of the Ellenburger was 8,057 ft., minus 5,502 ft. Drill-stem tests between 8,048-8,226 ft. developed gas flows and recovered 65° distillate, with gas volume to 6,000,000 cu. ft. and flowing pressures to 1,400 psi.

On test at 8,226-90 ft. 47° oil flowed in 11 minutes. It was flowed to pits for 27 minutes, then turned into tanks through 1-in. choke, gaging 46.4 bbl. of oil in 30 minutes. Calculated rate of flow was 93 bbl. an hour. Gas volume was over 3,000,000 cu. ft. and gas-oil ratio was 1,490:1. Flowing tubing pressure ranged from 2,250 psi. on the 1-in. choke, to 3,375 psi. on 10/65-in. choke. Operators planned to drill another 50 ft. and retest.

Other formations indicating production in 1 Tubb have been the San Andres, Glorieta, Fusselman (Silurian), and Waddell sand, of Ordovician age.

Virey and War-San development . . . Warren Petroleum Corp. has completed its 3-G TXL as a 2,475-bbl. Ellenburger producer in SW SE 39-41-T3S-T&P Survey, on the west side of War-San field. This is the southernmost field along the Dora Roberts ranch land. Production was through 24/64-in. choke, from open hole at 13,175-13,197 ft.

Forest and Cities Service 1-15 Fee, on the northwest side of Virey field, had additional Ellenburger pay on drill-stem test at 13,210-13,292 ft. Oil surfaced in 2 hours and 10 minutes and gaged 43.6 bbl. in 1½ hours. Recovery in the pipe was oil with no water. Operators planned to run casing and complete.

The same operators' 1-22 Fee, Virey field, prepared to complete from open hole. After acid treatment in the Ellenburger between 13,105-13,322 ft. the well flowed 43 bbl. of oil in 2 hours.

Forest and Cities Service has completed 1-C-1 Roberts for 3,571 bbl. of oil a day, based on an actual flow of 892.91 bbl. in 6

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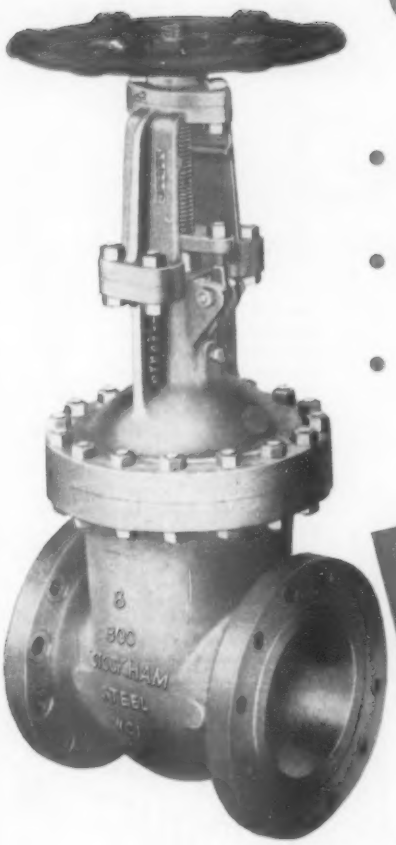

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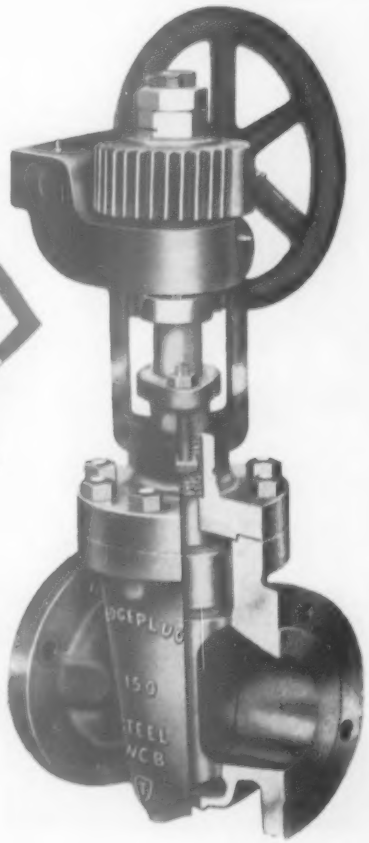

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hours through 1-in. choke. Pay section was open hole at 13,090-13,316 ft. Completion was without acid. Gas-oil ratio was 1,158:1; pressures were not reported. Location is in central Virey field, southwest of a recent northern extension well, and north of the 1-22 Fee.

SOUTHWEST TEXAS

New Gas-Distillate Area Opened In San Patricio

Discovery of a new productive area is indicated in southwestern San Patricio County where Lonnie Glasscock, in his 1 Weir, got a good flow of gas and condensate in tests of lower Frio sand, perforated at 5,832-36 ft. Flow was ungaged, but was under pressure of 1,850 psi. through ¼-in. choke. The area, in the John McMullen and San Patricio de Hibernia surveys, is 9 miles south of Mathis, and about 3 miles from nearest other production, Bluntzer field to the southwest and Round Lake field to the northwest.

Oil Production Indicated In Aransas Pass Wildcat

New oil production is indicated in a wildcat Arnold O. Morgan and B. A. Wales are drilling 2½ miles northeast of Aransas Pass and east of production in Aransas Pass field, in Aransas County.

The wildcat, 1 Stanley et al, filled 4,300 ft. with 35°-gravity oil in 24 minutes during a drill-stem test of sand interval at 7,802-10 ft. The recovery was through ¼-in. top and bottom chokes. Bottom-hole pressure was 1,975 psi. flowing and 3,400 psi. shut in.

Another test, taking in a slightly deeper interval at 7,822-26 ft. in the same indicated pay zone, got 800 ft. of oil and 800 ft. of salt water with bottom-hole pressure of 1,500 psi. flowing and 3,600 psi. shut in.

The prospective pay zone has been passed up for the time being.

The oil discovery is approximately ¾ mile southwest of a gas-condensate discovery well recently completed by Atlantic Refining Co. That well, which opened East Aransas Pass field, produced from Marginulina sand at 7,014-36 ft.

New Webb County Pool

Parr & Delaney Oil Co. has completed a new oil-discovery well in northeastern Webb County at its 1-C Parr. The well, located between two dry holes, pumped 26 bbl. of 20.7°-gravity oil per day from a shallow sand in open hole at 867-80 ft. Location, in San Casimiro Grant, is 20 miles northwest of Freer, in Duval County.

TEXAS GULF COAST

New Kain Test Explores Offshore Potentialities

Exploration under the Gulf of Mexico off the coast of Matagorda Peninsula is being attempted by Shell Oil Co. in the Kain area, 7 miles southeast of the town of Matagorda, in Matagorda County.

Shell's first offshore test on the gulf side of the peninsula is being directionally drilled from a surface location on shore. The latter location, 468 ft. in from the shore line, is the same as that of the company's 1 Baer, completed late in October as dry in vertical hole at 6,907 ft.

The vertical hole has been plugged back

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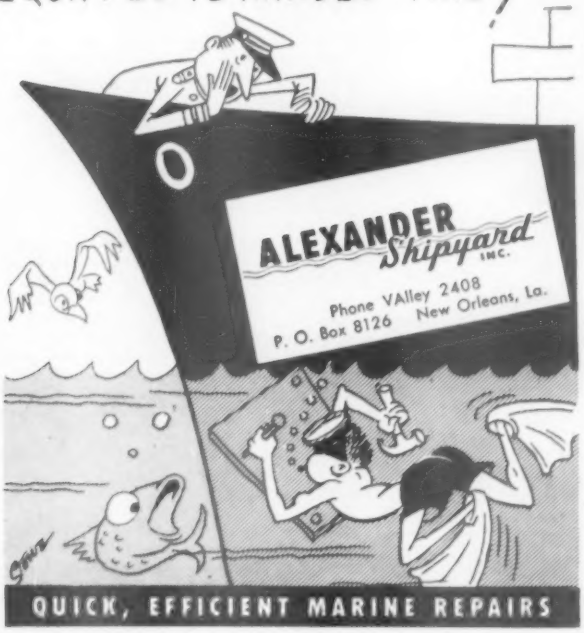

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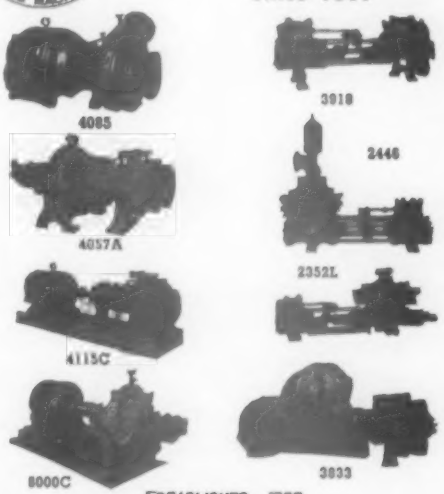

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and is being deflected to its offshore location 1,500 ft. to the south in Gulf of Mexico State Tract 486. The new hole is projected to a total depth of 8,000 ft.

Surface location and the Baer dry hole are approximately 6,500 ft. southeast of the area's discovery well, located on the Matagorda Bay side of the peninsula. The latter well, Shell's 1 Kain, was completed in August 1953 with gas-condensate production from Miocene sand at 6,015-25 ft.

Production in the area was confirmed last July by Union Producing Co. at an offset location 1,400 ft. to the northwest in Matagorda Bay. The confirmation well opened a deeper sand at 6,649-55 ft. Two other tests in the area failed to find production. Shell has one other operation, its 2 Baer, located approximately 2,500 ft. southeast of the discovery well.

NORTH TEXAS

Activity in Nolan County on Upswing

A second test for the 1-well E. A.-Ordovician pool 8 miles northeast of Blackwell, a good flowing well marking a west extension to Cambrian production in North Dora field and two projects to be drilled as step-outs to North Dora were in the week's news.

Humble Oil & Refining Co. will drill ½ mile north of its 1 Petty, in an effort to confirm Ordovician production. No. 1 Petty completed earlier this year in Ordovician dolomite at 6,085-6,138 ft., and the same operator's 2 Petty, 1 location to the west, was completed as a Cambrian discovery.

Skelly Oil Co. 13-B Boyd has extended Cambrian production to the west at North Dora, with a calculated potential of 1,660 bbl. of oil a day from Cambrian pay at 6,078-6,127 ft. The well made a 2-hour flow of 139.2 bbl. of oil through ¾-in. choke. Completion was without acid.

Skelly has also filed application to drill 14-B and 15-B Boyd as Cambrian tests in the North Dora area. Both locations are in Section 58, Block 20, T&P Survey.

New Grayson pool . . . Shell Oil Co. 1 R. O. Brown, Grayson County sand discovery 2 miles south of Pottsboro and 3 miles north of nearest oiler in Sherman field, has been completed for 252 bbl. of 34° oil a day, on 32/64-in. choke. Pay section was perforated at 7,660-81, 7,685-95 and 7,700-04 ft., after drilling to 8,500 ft. and plugging back. Flowing pressure was 100 psi.

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HUGOTON EMBAYMENT

Clark County Discovery Completed In Kansas

A new Morrow gas discovery 3½ miles southeast of Sitka has been gaged for 8,000 M.c.f. per day through 1-in. choke from perforations at 5,350-60 and 5,318-36 ft.

The Clark County strike is Sinclair Oil & Gas Co. 1 Combrink, NW SE 22-33s-21w. It is 2 miles north of Harpers Ranch field.

Important Keyes Sand Strike Finaled In Stanton

Stanton County has a new Pennsylvanian gas field at J. M. Huber Corp. 1 Sparks, C NE 34-30s-42w, 8 miles south of Manter and 10 miles west of Hugoton Permian production in western Kansas.

The pener of Sparks field reported a potential flow of 15,600 M.c.f. per day from Keyes sand perforations at 5,254-75 ft. The discovery has been shut in for some time with no confirmation tests announced as yet.

Northeast Hansford Has New Morrow Oil Strike

R. H. Fulton has taken final gage on his new Morrow oil strike in northeastern Hansford County, Texas Panhandle.

The 1 Lasater, Section 62, Block 45, H&TC Survey, 9 miles north of Spearman, flowed 498 bbl. of 39.5°-gravity oil per day through 1-in. choke and 368 M.c.f. of gas per day. Perforations in the Morrow were at 7,040-50 ft.

Sinclair has a confirmation test at 1-D Steele in Section 63. Fulton 2 Lasater is in Section 72. Both will test for the same zone. The discovery is located 2½ miles southeast of a Tonkawa (Pennsylvanian) gas well at Colorado Oil & Gas Co. and Fulton 1 Steele. Gruver field, nearest oil production, is 8¼ miles to the southwest. Hitchland field is 9½ miles northwest. The Morrow does not produce in these two fields. Morrow gas production is found at two sites about 5 miles southeast and southwest from the 1 Lasater.

Northwest Eva Expands In Texas County, Oklahoma

Northwest Eva field in the Oklahoma Panhandle's Texas County has a ⅝-mile south extension at Baker & Taylor Drilling Co. 1 Williams in NW NE 14-4n-10eCM.

The well flowed about 100 bbl. of oil in 24 hours through Cherokee sand perforations

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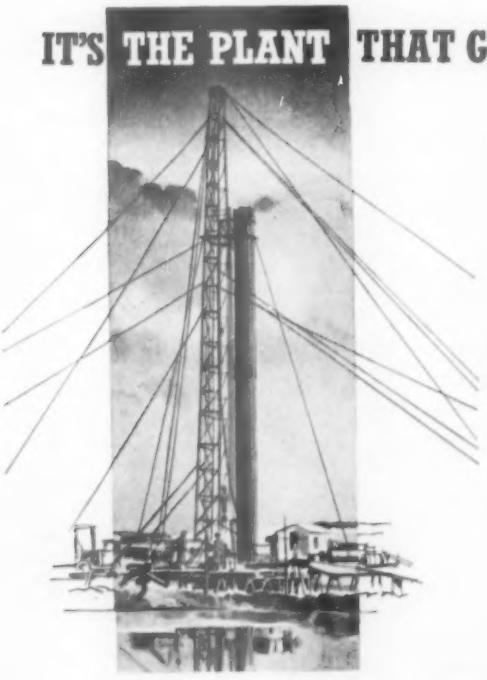

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at 4,028-31 ft. the south offset was dry. United Carbon Co. 1 Burns, SW SE 10-4n-10eCM, is setting up pump after swabbing and flowing 7 bbl. of oil per hour from Kelley sand perforations at 4,456-64 ft. The 2 Burns, a north offset, is drilling at 3,560 ft. In the main part of Northwest Eva, between the 2 Burns wells, the 10 Kelley, NW SW 11-4n-10eCM, flowed 428 M.c.f. of gas at 2,928-3,044 ft. and 4,450 M.c.f. from the Cherokee at 3,999-4,040 ft.

CALIFORNIA

Oxnard Deep Pays Draw Two Extension Tests

Two extension attempts shortly will be made to the deep Sespe pools recently discovered in Oxnard field, Ventura County. About 1¼ miles southeast of production, The Texas Co. has staked 1 Capital-Silva in NW NW 8-1n-21w. Slightly less than 1 mile east of the field, in NW Section 5, Laan Tex Oil Co. has taken over a 7,390-ft. test drilled last year by Intex Oil Co. The new operator planned to clean out and deepen the dry hole, 5-1 Capco.

Another operator, Jack Herley, also reportedly was scheduled to start a deep test about ¼ mile south of the new 10,000-ft. pool, drilling from the 100-ft. right-of-way strip of Southern Pacific Railway. A west extension attempt, Standard Oil Co. of California 101 Maulhardt Community, was nearing a depth of 6,000 ft. at a location ¾ mile west of production.

New San Fernando Find

C. W. Teater scored a shallow oil discovery near San Fernando, 2 miles east of Aliso Canyon production, when 1 Teater-Wadley was completed as a small pumper in an oil sand topped at 2,530 ft. With hole bottomed at 2,766 ft., the test pumped 22°-gravity crude at a 40-bbl. daily rate. Location of the new pool opener is in SW NE 25-3n-16w.

Eocene Shows Encountered

Richfield Oil Corp. at its wildcat 1½ miles southwest of Wheeler Ridge production, Kern County, encountered Eocene showings which looked none too favorable. About 90 ft. of oil-stained core was cut below 11,225 ft. An electric log obtained of the interval showed the top 20 ft. might be productive but below that the formation appeared wet. At last report the operator was coring ahead below 11,300 ft. at 2 San Emidio-B, located in NE SW 31-11n-20w.

New Midway-Sunset Tests

With a second producer apparently assured at the 5,300-ft. Miocene sand recently discovered in the Midway-Sunset field, Kern County, two new tests were preparing to start. The Texas Co. 56 "Well" was being prepared about ¼-mile southwest, in NE NE 32-32s-24e, and Exeter Oil Co. 12-J Murphy Fee was rigging up in SW SW Section 28. In SE SE Section 29, Standard Oil Co. of California was in process of completing 387 29-D as a northwest offset to the discovery.

INDIANA

In Posey County's North Smith Mills pool Dick Portis 1 Stock-Wolfinger Unit, SE NW SE 29-7s-12w, has an IP of 210 bbl. of oil

per day from the Cypress sand at 2,365-70 ft. This is one of the best wells to be drilled on the Indiana side of the Kentucky pool. The Ohio River divides the pool into two parts and two states.

KANSAS

Ellis County Has New Oil Pool

Eagle Creek field was opened in Ellis County at Veeder Supply & Development Co. 1 Irwin, NW NW NW 11-11s-20w.

Daily potential of the new discovery was 1,961 bbl. of oil. Production is from Lansing-Kansas City lime at 3,368-80 ft.

Promising Barton County Well Testing Lansing Lime

Pabco Drilling Co. has a promising wildcat in Barton County at 1 Simmons, SE SE SW 3-18s-11w.

Recovery on a drill-stem test in the Lansing at 3,067-3,107 ft. was 129 ft. of heavy oil and gas-cut mud and 124 ft. of free oil. The wildcat prospect is 1 mile northeast of Ames field and 1½ miles northwest of Roesler field.

LOUISIANA

SOUTH LOUISIANA

Deep Production Opened In Assumption Discovery

A new, deep gas-condensate field is being opened in northwestern Assumption Parish, 30 miles southwest of Baton Rouge.

Its discovery well, 1-B Brownell-Kidd, drilled by Cities Service Oil Co. and Delhi Oil Corp., produced at the rate of 119 bbl. of 48.7°-gravity condensate with 2,800,000 cu. ft. of gas per day through ¼-in. bottom and ⅛-in. top chokes on pre-potential tests. Shut-in pressure gaged 4,700 psi.

Production is from a casing-perforated interval at 13,604-06 ft. in Miocene sand in hole drilled to 14,303 ft. A total of 50 ft. of gas sand had been logged.

Location, shown by arrow on map, is approximately 4 miles west of nearest production at Napoleonville.

New Grand Chenier Well Opens Deeper Gas Sand

Fifteen Oil Co., of Houston, is completing its second well in the new gas-condensate producing area 1 mile southwest of Grand Chenier field, Cameron Parish. It is ½ mile southeast of the company's discovery well, completed last May, and opens another pay zone, 400 ft. deeper.

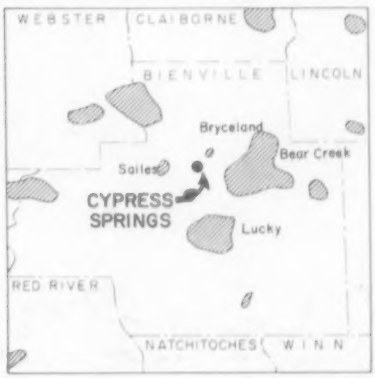
The new well, perforated at 11,210-20 ft., flowed at the rate of 1,000,000 cu. ft. of gas per day through $\frac{7}{8}$-in. bottom and ⅛-in. top chokes. Gas yielded between 15 and 20 bbl. of condensate. Flowing pressure was 3,850 psi. Total depth is 12,020 ft.

Discovery well, 1 Nunez, flowed 36 bbl. of 45.8°-gravity condensate with 4,355,000 cu. ft. of gas per day through ¼-in. choke from sand interval at 10,802-07 ft. Pressure of 3,585 psi.

NORTH LOUISIANA

Cypress Springs Field Opened In Bienville

Bienville Parish has a new Pettit oil field. Pure Oil Co. opened Cypress Springs field, named after a small church 1½ miles west, at 1 J. B. Smith Unit, NW¼ 35-17n-7w.



New Cypress Springs field in Bienville has Pettit production.

The discovery flowed 238 bbl. of 38.5°-gravity oil per day on 20/64-in. choke. Perforations were at 7,022-40 ft. Depth bracket schedule allows 103 bbl. per day from wells completed at interval between 7,000 and 8,000 ft.

The new field is located 2¾ miles southeast of Sailes and 3⅝ miles southwest of Bryceland field.

KENTUCKY

EASTERN KENTUCKY

On Spring Creek in Clay County, United Fuel Gas Co. is drilling below 1,500 ft. on their wildcat 8 Fordson Coal Co. Pennsylvanian salt sand was topped at 1,233 ft.

In Big Sandy gas field, United Fuel Gas Co. has completed 79 Federal Gas, Oil & Coal Co. on Muddy Branch in Martin County for 1,975,000 cu. ft. of gas daily from Mississippian Big lime. Well was acidized from 1,651 to 1,755 ft. for completion. Total depth is 1,821 ft. and a 24-hour rock pressure showed 478 psi.

APPALACHIAN AREA

WEST VIRGINIA

Dry Fork district, Randolph County, West Virginia, Columbian Carbon Co. 1-1202 U.S.A., wildcat, elevation 3,036 ft., completed with an encouraging flow of gas gaging 696,000 cu. ft., after Sandfrac, Oriskany sand 4,854-5,075 ft., gas 4,992-5,023 ft., TD 5,082 ft. In Roaring Creek district, Seneca Gas & Oil Co. 1 D. H. Hill Arnold, elevation 2,338 ft., tested 55,000 cu. ft , gas, fifth sand 2,076-2,126 ft., gas 2,108 ft., TD 2,289 ft.

PENNSYLVANIA

In Salt Lick Township, Fayette County, Southwest Pennsylvania, Mid Atlantic Oil & Gas Co. 1 Adolph Dupre, rank wildcat was dry, chert 8,191-8,355 ft., Oriskany sand 8,355 ft., TD 8,476 ft.

ROCKY MOUNTAIN

UTAH

Grand County Wildcat Recovers Oil

Delhi Oil Co. recovered clean oil on test of lower Paradox at 2 Utah, SW NW SW 18-25s-31e, 5 miles northwest of Moab, Grand County. Test was run at 7,621-82 ft., and with tool open 1 hour, recovery was 560 ft. of clean oil and 940 ft. of very heavily oil-cut mud. Flowing pressure was 425-520 psi. Gas flowed after 4 minutes, with the rate at 177,000 cu. ft. per day at the end of 16 minutes.

The well is on farmout from Pure Oil Co. and has been drilled tight to the present depth. It was scheduled as a test in a series of potash exploration holes, but will now be drilled to Mississippian.

An earlier test at 7,611-52 ft. flowed gas at the rate of 108,000 cu. ft. per day, with recovery of 700 ft. of oil and water. This general Utah area has had previous shows of oil in Paradox, but at the present time has no production.

Three New Wildcats Announced

Phillips Petroleum Co. has located for a wildcat 15 miles north of Bar-X Unit, Uintah County. The well is 1 Two-Waters, C SW SW 22-14s-25e. Objective was not reported, but production at Bar-X is from Dakota and Entrada.

In Grand County, 12 miles southeast of Bar-X, Great Western Drilling Co. and R. S. Brennan, Jr. are preparing to spud 1 Federal, C SW NE 21-18s-24e. Blackwood and Nichols have made location for a wildcat at 1 Government, SW NE SW 28-24s-10e, in Emery County.

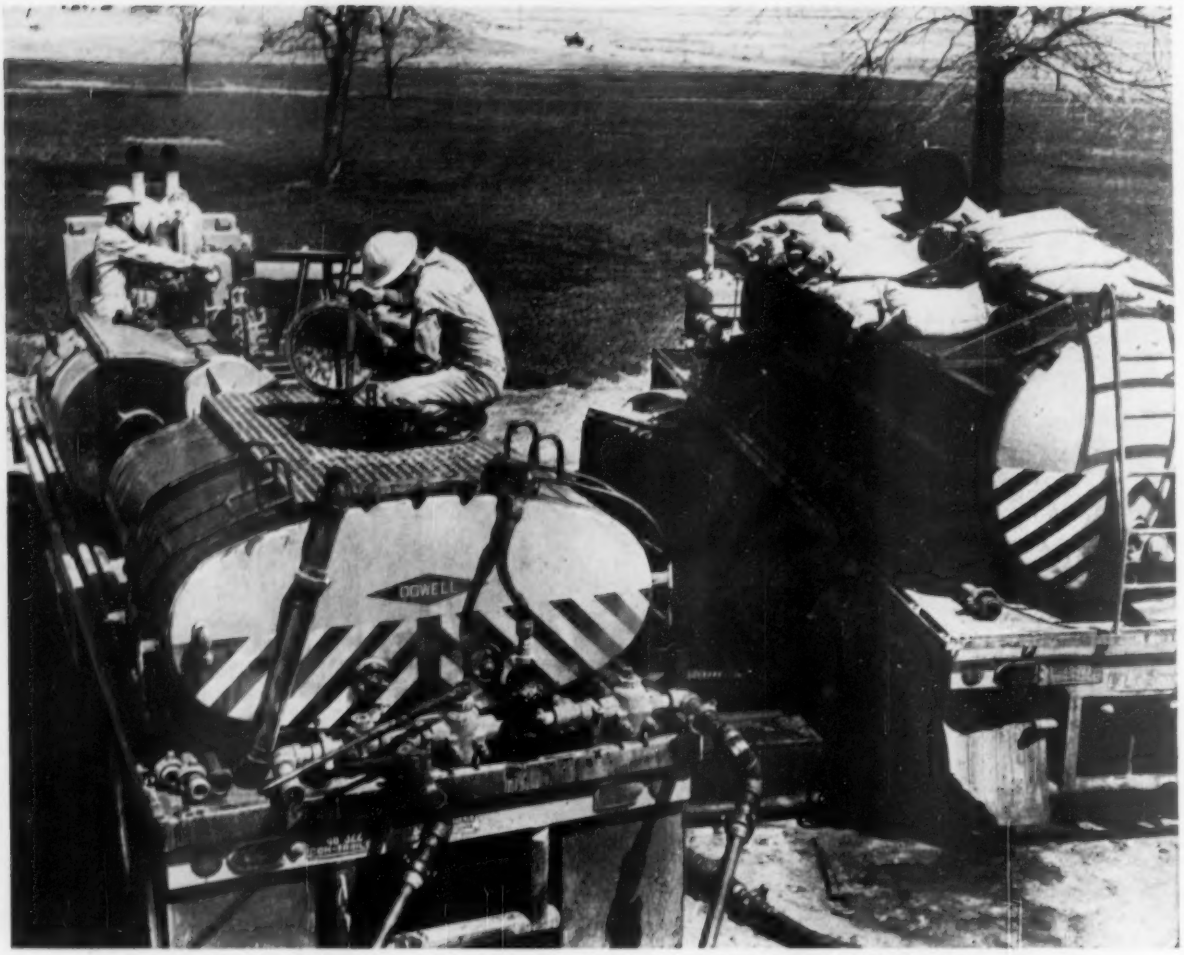
MONTANA

Wolf Creek Area Wildcat Located

Continental Oil Co. is preparing to spud at 6,600 ft. Mission Canyon test at 1 Landon, C SW SW 1-30n-46e, in the Wolf Creek area, Roosevelt County. The wildcat is 2 miles northeast of Wolf Creek pool, discovered by Continental in 1952.

Offset Staked At Fallon County Discovery

McAlester Fuel Co. and Goldston Oil Co. have made location for 1-A NP, C NW NE 19-7n-61e, in the East Baker area of Fallon County. The well is a southeast offset to the still uncompleted Monoco Oil Co. discovery



Dowell engineers were called to treat this salt water disposal well when the injection rate had dropped to 5 BWPH. A Waterfrac treatment increased the injection rate to 159 BWPH.

WATERFRAC: NEW DOWELL

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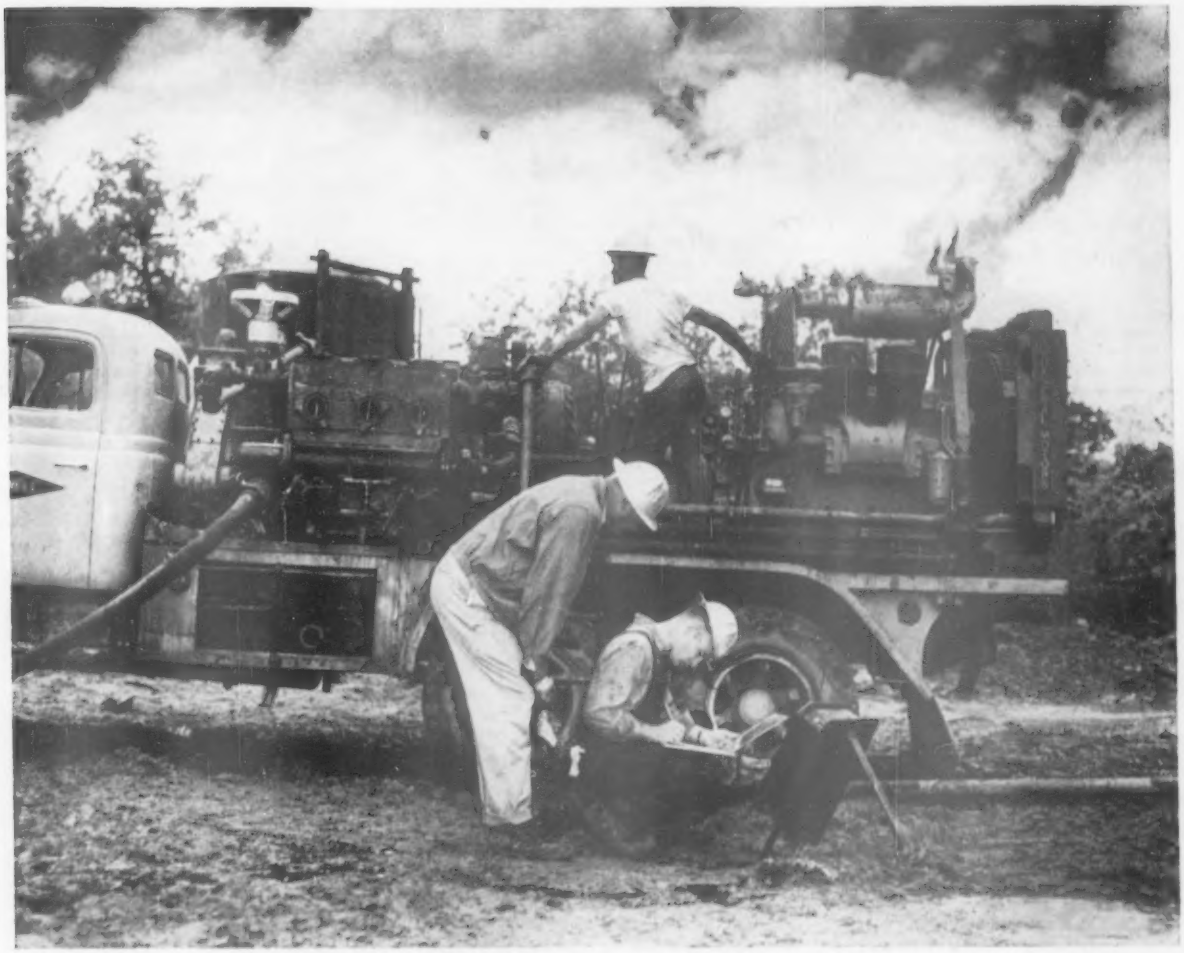

An injection well on a water flooding project would take only 25 BWPD. A Waterfrac treatment by Dowell increased the well's capacity to 300 BWPD, which settled down to 230 BWPD.

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at 1 Ferguson-Goldin, C N½ SE SW 18-7n-61e. The latter well recovered 8,990 ft. of free oil from Ordovician, according to details released by the operator. Reports that a flow of 11 bbl. of oil per hour resulted from further testing have not been confirmed by the operator.

The Monoco discovery is tentatively classified as a discovery in stratigraphic trap in Ordovician east of the Cedar Creek anticline.

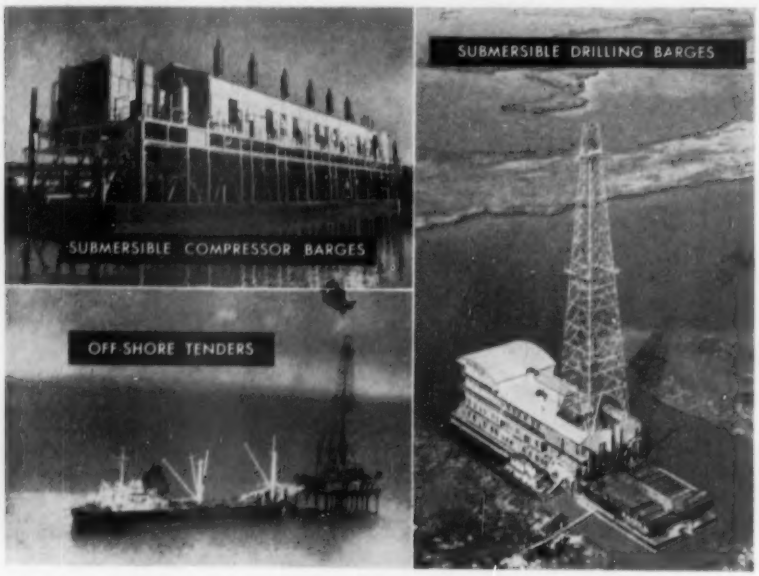
West Poplar Discovery Installing Pump

Carter Oil Co. and Phillips Petroleum Co. are installing pump at their apparent discovery at 1 Tribal, C SW SW 5-29n-50e, Roosevelt County. The well, in the West Poplar unit, swabbed at the rate of 112 bbl. of oil, 28 bbl. of sediment and 25 bbl. of water in 16 hours. Production is from Madison at 6,450-68 ft.

NEBRASKA

Rank Banner County Wildcat Successful

Rex Petroleum Co. recovered oil on test of "J" sand at a wildcat 12 miles southeast of Harrisburg field in Banner County, in an area which has had practically no previous drilling. The well is 1 Johnson, C SW NE 27-18n-53w. Test was at 5,458-66 ft., and with tool open 2 hours, 25 minutes, recovery was 1,260 ft. of clean oil and 400 ft. of oil and gas-cut mud. Flowing pressure reached 450 psi. at the end of the test.



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The operator reported core of 12 ft. of apparently productive sand in four sections within the interval 5,451-73 ft. The operator has run pipe and is waiting on completion rig. Closest production is at the small Schmid pool, 9 miles south in Kimball County.

Kimball County Discovery Near Completion

Rock Hill Oil Co. and Twin Oil Co. are waiting on completion tools at 1-A Vrtatko, NE NE SE 7-13n-54w, apparent Kimball County discovery. The operators recovered 165 ft. of oil, 90 ft. of mud-cut oil and 3,245 ft. of brackish water on drill-stem test at 6,005-22 ft. in "D" sand. The tested interval included a 14-ft. section of apparently productive sand, plus a 6-ft. zone analyzed as wet. Tool was open 1 hour, with flowing pressure 1,050-1,400 psi.

The well is 3 miles east of Enders field and about 1½ miles west of production in Goodwin field.

COLORADO

New Tests In Progress At Jackson County Discovery

Lion Oil Co. is swabbing at the rate of 9.9 bbl. of oil per hour at 1 Dwinell, C NE SW 23-10n-79w, Jackson County, pool opener in Battleship field. Production is from Dakota perforations at 4,561½-69 ft. The well also made oil from Lakota, but is not now testing that formation.

The 9.9-bbl. per hour rate followed sand-frac. Operator swabbed 122 bbl. of oil in 10 hours after treatment, and is continuing to swab.

Adams County Wildcat Recovers "D" Sand Oil

Ryan-Davis Oil Co. and Potter Drilling Co. recovered oil on test of "D" sand at 1 Knox, SW SW SE 35-1s-59w, Adams County. Test was at 6,154-69 ft. With tool open 1½ hours, recovery was 1,000 ft. of oil and 250 ft. of mud.

The well is 3 miles northeast of Leader field, and about 12 miles west of Little Beaver. This area has been of considerable recent interest to operators in the Denver-Julesburg basin, with the Leader discovery among three to offer encouragement. The operators will test "J" sand before running pipe.

WYOMING

Sweetwater County Wildcat Abandoned

The Chicago Corp. and Republic Natural Gas Co. have abandoned 1 Government, C SW NW 26-18n-104w, in the Six Mile Spring area of Sweetwater County. Gas flowed at the rate of 143,000 cu. ft. per day on test of the zone 2,940-70 ft. and other tests also recovered noncommercial quantities of gas. Total depth of the wildcat is 4,671 ft.

Sherwood Unit Wildcat Tested

Stanolind Oil & Gas Co. has reported a swab recovery of 104 bbl. of oil per day following acidization of 1 Sherwood Unit, C SE NW 3-40n-77w. Production is from the zone 11,017-11,032 ft. The well is shut in due to weather, with tests due to resume when practicable. The apparent discovery is 2 miles east of Salt Creek field, in Natrona County.

Park County Deep Test Running Casing

Trigood Oil Co. is running casing at 1 Meeteetse Unit, C SE NW 28-49n-99w, Park County. The well went to total depth of 11,471 ft. Unofficial reports, not verified by the operator credit Trigood with recovery of free oil from Phosphoria.

Previous drilling in the general area logged good shows in both Phosphoria and Tensleep.

NEW MEXICO

SOUTHEAST NEW MEXICO

Continental 2 Bell Lake Flowing Gas and Distillate

Continental Oil Co. 2 Bell Lake Unit, Lea County wildcat in 30-23s-34e, flowed gas and distillate on a test of the Wolfcamp through perforations at 12,635-12,665 ft. In 10 hours, through 15/64-in. choke, distillate yield was reported at 60 bbl. and gas volume at the rate of 2,035,000 cu. ft. daily.

Continental 1-A Bell Lake, twin test to the discovery which had to be abandoned due to blowout and fire, flowed water with a film of distillate, plus gas of around 1,300,000 cu. ft. daily on tests at 12,545-12,601 ft. Operators then cored from 12,601-12,658 ft., recovering 54 ft. of shale and lime with gas odor. A drill-stem test of the cored interval was under way at last report.

A heavy flow of oil from a Blinebry sand discovery, east of Clear Fork production in the Brunson-Hare area of southeastern Lea County, has been made by Western Oil Fields 2 Bunin, NE NW 13-21s-37e. On a 4-hour test the well flowed 45 bbl. hourly from a 50-ft. pay zone topped at 5,655 ft.

MICHIGAN

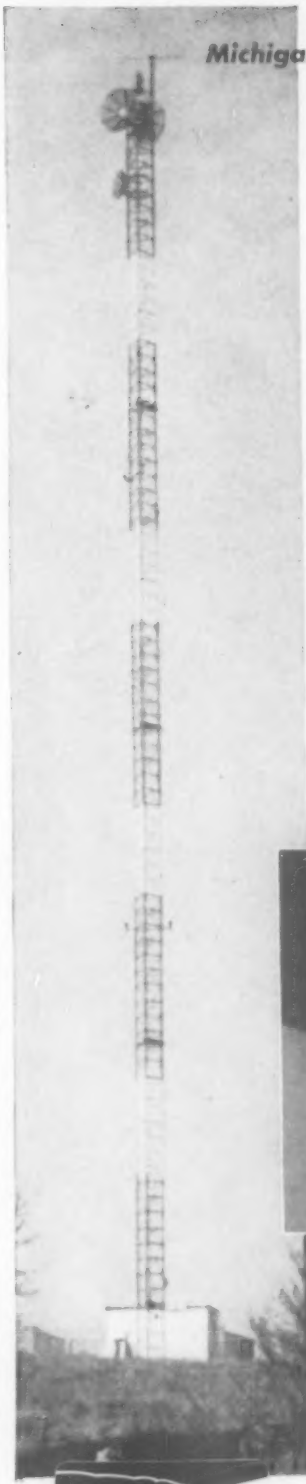
Northville Trenton oil and gas pool, Washtenaw, Wayne & Oakland counties, was established this week to carry oil and/or gas in this objective over a span of 4 miles, northwest and southeast.

Developments further to the northwest, at Taggart Co. 1 Partrige & Fitzgerald, SW NE NW 12-1s-7e, appeared to definitely assure both oil and gas production from the Trenton, while on the southeast side of the 4-mile strike, Wood Oil Co. 1 Daughter of St. Mary of Providence, SE SW NE 17-1n-8e, was the extender on this side of the pool. Gas pay was developed here but no oil was encountered in the Trenton-Black River.

Taggart Co. 1 Partridge & Fitzgerald was shut down at 4,397 ft. Well showed for 1,550,000 cu. ft. of gas a day at 4,357-95 ft. At 4,397 ft., well started to spray oil. Further testing, and possible deepening was scheduled for next week. The gas-oil pay was tapped at a point comparable to the oil pay logged at the 1 LeMaster discovery well, with room for deepening before reaching a point equal to the LeMaster total depth.

The Woodson outpost to the southeast was bottomed out in Trenton at 4,419 ft. Top of Trenton was logged at 3,989 ft. Well is being completed in the upper Trenton between 135 and 285 ft. in the objective where gas pays showed for a minimum estimate of 2,000,000 cu. ft. of gas a day from 4,255-75 ft.

Meanwhile, the problems faced by Northville pool operators in completing and producing Trenton oil wells was spotlighted when Edward Torosian, because of an excessive gas/oil ratio, voluntary shut in his 2 Ner-



Michigan-Wisconsin Pipeline Company

Assures power for repeater stations with ONAN Standby Electric Plants

Microwave radio handles communications for the Michigan-Wisconsin pipeline which carries natural gas from Texas fields throughout Wisconsin and Michigan.

Of the 60 repeater stations in the system, 53 are unattended and are equipped with Onan Standby Electric Plants and Onan Automatic Line Transfer Controls. When commercial power is interrupted, the Onan plants start automatically and supply power for operating microwave equipment.

Most of the Onan units are Model 305CK electric plants of 3,500-watt capacity. This model, together with the Onan 5 and 10KW "CW" electric plants have built-in advantages for microwave standby service. They are air-cooled, extremely compact, and dependable.

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Onan Model 305CK shown installed in the repeater station at Waukesha, Wisconsin. Bottled gas is used for fuel.

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This new control facilitates testing of all control components as well as the engine generator set. Momentary contact switch transfers load from commercial power to the generating plant with only 1/10th second interruption. Generator can be exercised by itself if desired. Control incorporates time-delay starting, stopping. Voltage sensitive relays, both on the commercial line and on generator output, assure correct voltage before transferring load.

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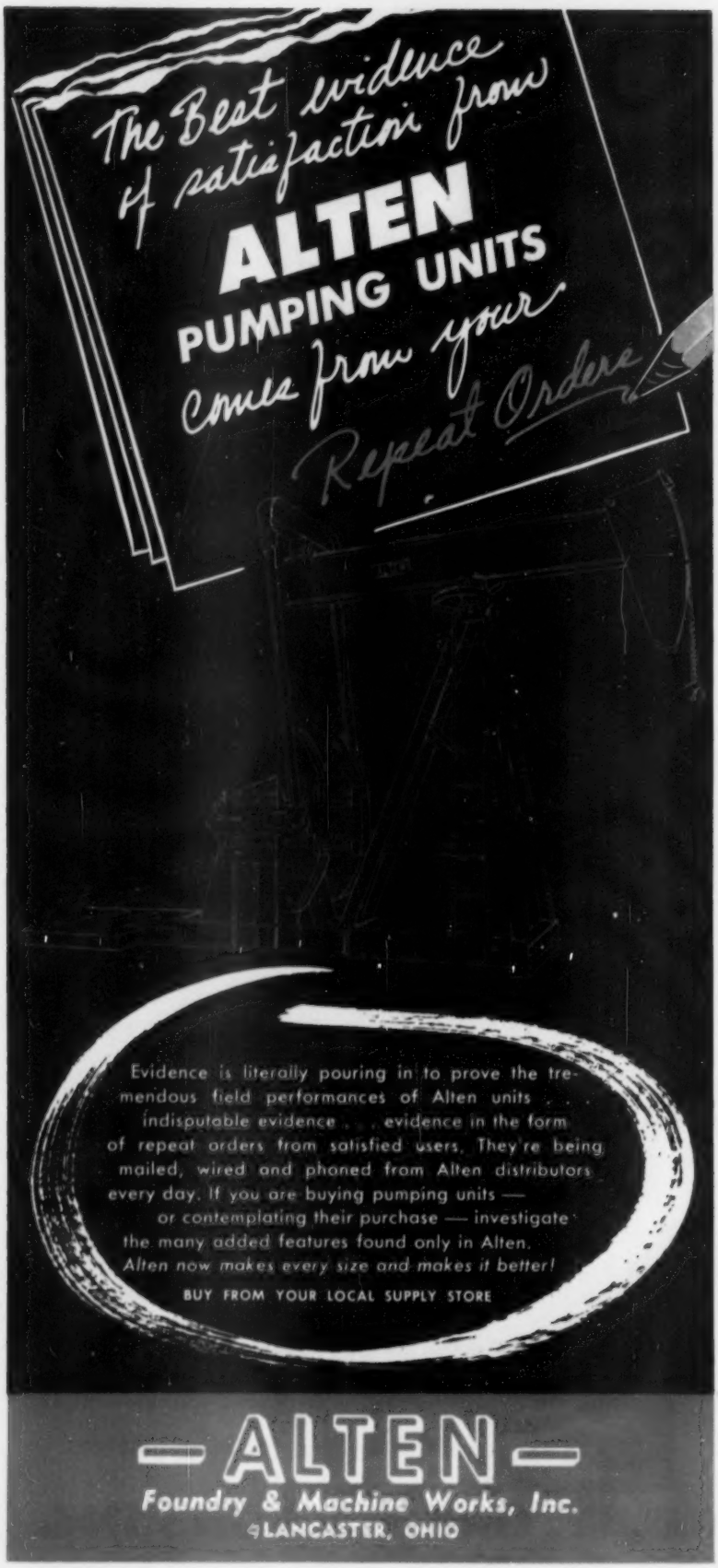
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reter, NE SE NE 2-1s-7e, considered to be the second big oil completion for the pool in the so-called LeMaster pay. On a 6-hour flow test this week, well was calculated to be producing oil at a rate of 88 bbl. daily, and gas at a rate of 1,089,480 cu. ft. daily, against an allowed 1,000 cu. ft. of gas per bbl. of oil, and not more than 200 bbl. of oil a day. Gas-oil ratio was 12,380 cu. ft. per bbl. The proration schedule for the pool was established to conserve reservoir energy for production of oil. Perhaps field should be considered first as a gas pool and secondly as an oil reservoir, rather than vise versa.

CANADA

Western Canada Adds Seven New Discoveries

There were seven new strikes in western Canada last week. They gave up indications of crude oil or natural gas. Four of the new finds were in Alberta, while Saskatchewan contributed the others. The Alberta wells were in the Wood Lake, Pakowki Lake, Sage Creek, and Cecil areas. Saskatchewan's were in the Viewfair, Alida, and White Bear regions.

Wood Lake . . . In the Wood Lake area, Cities Service Oil Co. discovered some very high gravity oil along with gas. In addition, this wildcat had also given up some free oil in the basal Blairmore, and crew is now preparing to test this lower formation. The wildcat is the 1 Wood Lake in LSD 6, 20-40-4w5.

Sage Creek . . . British American Oil Co., Ltd.'s well in the Sage Creek area of Alberta, discovered gas reaching in excess of 4,000 M.c.f. per day, and also recorded a slight oil show in the J2B section of the Jurassic. The well is the 10-8 Sage Creek on LSD 10, 8-2-1w4.

Pakowki Lake . . . New British Dominion Oil Co., Ltd., and United States Smelting, Refining & Mining Co. have discovered gas in what appears to be a separate sand in the Bow Island formation at their initial well in this area of Alberta. The discovery is the 11-20 Pakowki, LSD 11, 20-4-8w4, 3¼ miles northeast of McColl-Frontenac-Union 7C-6-4-8, Bow Island gas well.

Cecil area . . . In the Cecil area, 32 miles southeast of Brooks and 35 miles northwest of Medicine Hat, a medium-gravity oil discovery was made by Socony-Vacuum. The well found 10 to 15 ft. of basal Blairmore sand oil pay. The well is Socony-CPR 10-10 Cecil on LSD 10, 10-14-12w4.

Saskatchewan . . . This province's most encouraging strike was at Imperial Oil, Ltd.'s well in the Alida area in the southeast portion of the province. Discovery came in the Mission Canyon section of the Mississippian, which flowed oil from that formation.

The well is the 4-35 Alida, LSD 4, 35-5-33w1, 20 miles west of the Manitoba line and 30 miles northeast of Frobisher oil field.

White Bear . . . Another Saskatchewan well, in the White Bear Indian Reservation, 6 miles north of Carlyle and 72 miles east of Weyburn, is the Tide Water 4 White Bear on LSD 9, 12-1-3w2.

Viewfair . . . The other province find came at a small gas strike 25 miles northeast of Kindersley in the southwest corner of the province. Canso Oil Producers, Ltd. got this one at 6-35 Viewfair on LSD 6, 35-31-20w3.

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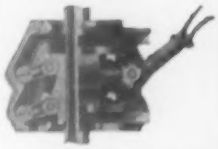

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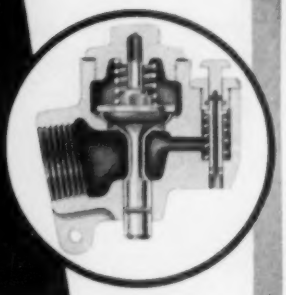

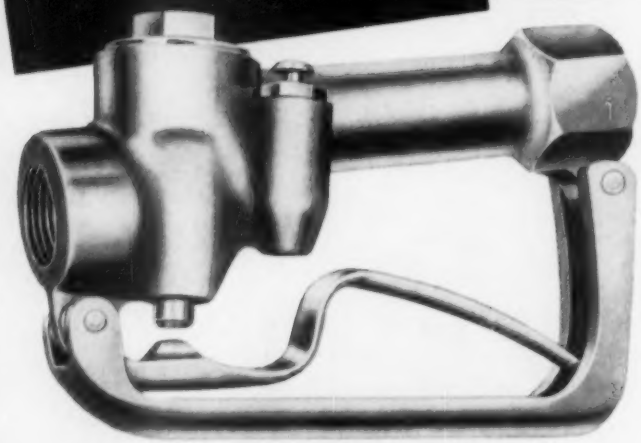

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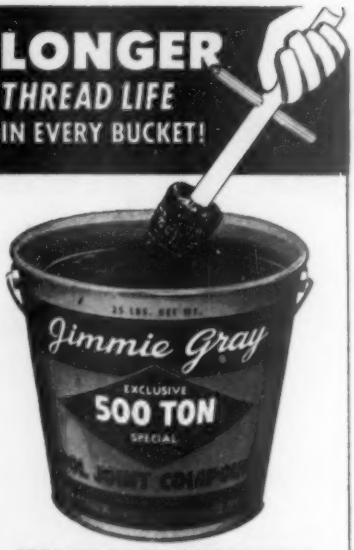

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SOUTHWEST TEXAS

District 1

Atascosa County: Appell Oil & Gas Corp. 1 Davis, Mary J. Votaw Sur. 265½, A-856. Dry. TD 5,371 ft.

Bexar County: General Crude Oil Co. 1 Rogers Ranch, Block 4396, J. S. Collard Sur. 256, A-151. Dry. TD 5,896 ft.

Frio County: Walter R. Koch 1 Bell, Section 5, J. H. Gibson Sur., A-353. Dry. TD 4,750 ft.

LaSalle County: Horace Coon, Jr., and C. G. Dunwoody, Jr., 1 Storey, Section 141, H&GN Sur., A-268. Dry. TD 3,312 ft.

Monterey Oil Co. 1 Gluck, Section 55, Block 13, O'Connor Ranch Subd. Dry. TD 6,802 ft.

Wilson County: Sun Oil Co. 1 Bain, N. L. Roberts Sur. 149. Dry. TD 4,600 ft.

District 4

Hidalgo County: George H. Coates 1-A Engleman Community, Section 69, Las Mestenas Grant (San Salvador area). Dry. TD 8,002 ft.

Kleberg County: Sun Oil Co. 2-B Dunn-McCampbell, Tovar Sections, Padre Island. Dry. TD 7,502 ft.

San Patricio County: Arnold O. Morgan and Union Oil Co. of California 1 Eva Day unit, Lot 14, Block E, Burton & Danforth Subd. Dry. TD 9,520 ft.

O. K. Smith Drilling Co. 1 Dinn, Section 27, George H. Paul Subd., J. J. Welder Ranch. IP 16,000 M.c.f. daily, open-flow potential, GOR 114 M.c.f. per barrel, 58°, Frio 5,580-88 ft. (perforations), 10,000 M.c.f. daily, open-flow potential, GOR 898 M.c.f. per barrel, 46.8°, Frio 4,416-24 ft. (perforations). TD 6,010 ft. (Extends East Mathis field.)

Starr County: Ammco Oil Co. 1-B Gutierrez, Tract 1, Survey 767. Dry. TD 4,210 ft.

TEXAS GULF COAST

District 2

DeWitt County: H. R. Smith, George Coates, and Producers Corp. of Nevada 1 Boothe, Francis Trippard Sur., A-456. Dry. TD 9,532 ft.

Jackson County: Kilroy Co. of Texas 1 Collett et al, GC&SF Sur. 1, A-341. Dry. TD 8,615 ft.

Refugio County: Sun Oil Co. 1-B State, Tract 59, Copano Bay. Dry. TD 9,832 ft.

District 3

Brazos County: Edwards & Bissett 1 McGregor, E. M. Millican Sur. Dry. TD 4,040 ft.

Chambers County: Greenbrier Oil Co. 1 Smith et al, John Steele Sur., A-227. Dry. TD 8,445 ft.

Colorado County: Houston Oil Co. of Texas, R. A. Irwin, and James R. Buck 2 Duncan, James Ross Sur., A-39. Dry. TD 6,850 ft.

Montgomery County: Magnolia Petroleum Co. 1 Arcenaux, Thomas Taylor League 1/3, A-546. IP 113.7 BOPD, 9/64-in., 36.9°, perforations 9,172-75 ft. TD 9,509 ft. (New field.)

Wharton County: Caribbean Oil Corp. 1 Hancher, T. W. Heard Sur. 30, A-510. IP 120 BOPD, 8/64-in., 30.4°, Frio 5,792½-94½ ft. (perforations). TD 6,015 ft. (New pay in Lou Hill field.)

J. B. Ferguson 1 Hudgins Unit 1, E. McKenzie Sur., A-42. Shut-in gas well, no gage, perforations 2,781-86 ft. TD 2,946 ft. (Extends West Bernard field.)

Union Oil Co. of California 1-A Koch, J. Dever Sur., A-457. Dry. TD 5,914 ft.

EAST TEXAS

Anderson County: Stroube & Stroube 1 Seale estate, H. E. Davis Sur., A-243. Dry. TD 5,070 ft.

Cherokee County: E. L. Howard 1 Staton, C. W. Miller Sur., A-615. Dry. TD 5,023 ft.

Hunt County: H. R. Beisel 1 Adams, M. L. Parker Sur., A-820. Dry. TD 2,995 ft.

Lamar County: R. O. Williamson 1 Hughes, Seth Swinford Sur. Dry. TD 2,716 ft.

Rusk County: Magnolia Petroleum Co. 1 Don Langston, Joseph English Sur., A-265, 7 miles E Mount Enterprise. IP 6,300 M.f.g., plus 25 bbl. 56° distillate, GOR 247,000, perforated upper Rodessa 6,064-86 ft. TD 7,480 ft. Shut-in TP 2,475 psi.

Smith County: Sam Trant 1 Arnold, Ben Lafferty Sur., A-13. Dry. TD 3,855 ft.

Wood County: R. W. Fair 1 Bradshaw, Antonio Calderon Sur., A-2. Dry. TD 5,513 ft.

TEXAS PANHANDLE

Wheeler County: Stanolind Oil & Gas Co. 1 Herd-Strat test, Sec. 3, IRR. Dry. TD 3,950 ft. plus or minus.

WEST CENTRAL TEXAS

Callahan County: Davis & Davis, Inc. 1 Barr, Blk. 41, Comal CSL Sur. 181. Dry. TD 1,565 ft.

Patrick A. Doheny 1 Jones, Blk. 85, Comal CSL Sur. 181. Dry. TD 1,611 ft.

Tom Gordon 1 Berry, Sec. 58, BBB&C Sur. Dry. TD 1,952 ft.

S. C. Herring 1 Hobbs, Bake Larkin Sur. 781. Dry. TD 3,506 ft.

R. D. Jackson & C. B. Frost 1 Harlove,

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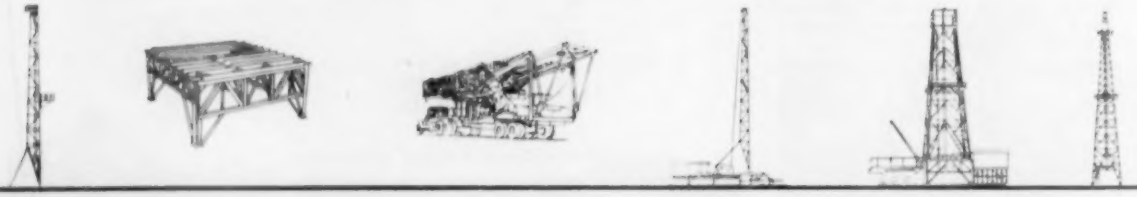

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Blk. 88, Comal CSL Sur. 181. Dry. TD 1,560 ft.

J. P. Westmoreland 1 Rose, 10-8-SPRR. Dry. TD 2,214 ft.

Coleman County: Allison & Prestridge 1 Roberts, 82-1-GH&H. Dry. TD 2,375 ft.

Miami Operating Co. 1 Freeman, W. G. Strickland Sur. 6. Dry. TD 3,848 ft.

T & O Drilling Co. 1 McCord, Blk. 111, Wade H. Bynum Sur. 272, 2½ miles SW Santa Anna. IP 132 BOPD, 4/16-in., 43°, TP 300 psi., GOR 1,250, Breneke sand 1,802-04 ft. TD 1,807 ft.

Haskell County: Sojourner Drilling Co. 1-K Hendrick, J. Mathews Sur. 4. Dry. TD 3,488 ft.

Jones County: Elm Oil Co. 1 Huddleston, 48-18-T&P. Dry. TD 5,825 ft.

J. W. King, Jr. 1 Dunnigan, Subd. 93, DeWitt CSL Sur. 126. Dry. TD 3,010 ft.

N. P. Powell 1 Sundquist, Sec. 203, BBB&C Sur. Dry. TD 3,200 ft.

M. D. St. John 1 Chittenden, Subd. 28, L. Kratz Sur. 335. Dry. TD 3,169 ft.

Palo Pinto County: White & Salmon 1 Gold, 60-1-T&P. Dry. TD 516 ft.

Parker County: Ben J. Taylor 1 Durham, Sec. 176, T&P Sur. Dry. TD 6,200 ft.

Shackelford County: B G H Oil Co. 1 Swenson, Sec. 170, BBB&C Sur. Dry. TD 1,680 ft.

G. Demohenschildt 1-A Davis, 2-13-T&P. Dry. TD 1,650 ft.

Rhodes Drilling Co. 1 McWhirter, Sec. 47, BOA Sur. Dry. TD 4,069 ft.

Three Sisters Drilling Co. 1 Dyer, 85-12-T&P. Dry. TD 952 ft.

Woodson Oil Co. 1-C Hendrick, Sec. 179, ETRR Sur. Dry. TD 1,524 ft.

Woodson Oil Co. 1 Morris, Sec. 24, BAL Sur. Dry. TD 4,343 ft.

Stephens County: Fenix & Scisson 1 Sikes, 13-6-T&P, 7 miles SE Breckenridge. IP 2,950,000 cu. ft. gas, open flow, pay 4,910-40 ft. TD 4,945 ft.

W. F. Holmes 1 Frambrough, Sec. 10, BAL Sur., A-1076. Dry. TD 1,860 ft.

John H. Wilson 1-A Pitzer, 5-4-T&P. Dry. TD 3,950 ft. Caddo 3,163 ft.

Lauderdale & Straughan 1 Hamilton, 17-1-SPRR. Dry. TD 4,472 ft. Caddo 4,472 ft.

Rhodes Drilling Co. 1 Gannaway, Subd. 3, J. M. Swisher Sur. 457. Dry. TD 4,452 ft.

NORTH TEXAS

Archer County: Blandin-Fraser 1 Coleman, Blk. 81, Lot 1, John Kelly Sur. Dry. TD 1,478 ft.

C. D. Knight 1 Petrex Oil Corp., Blk 115, ATNCL Subd. Dry. TD 1,505 ft.

H. F. Snebold 1-B Petrex, Blk. 44, ATNCL. Dry. TD 4,031 ft.

Baylor County: Archer Drilling & Production Co. 1 Hall, TE&L Sur. 3135. Dry. TD 1,521 ft.

Oakland Corp. 1 McFarin, 60-45-H&TC, 3½ miles S Bomarton. IPP 51½ BOPD, 35°, pay 1,451 ft. TD 1,457 ft.

West Central Drilling Co. and E. L. Wilson 1 Ross, Sec. 9, T&NO Sur. Dry. TD 1,805 ft.

Clay County: L. T. Burns 1 Threadgill, Eva Bullinger Subd., Orange CSL, A-368. Dry. TD 6,749 ft.

Cooke County: Bridwell Oil Co. 1 Judy, John Russell Sur., A-862, 4 miles NE Gainesville. IPP 39 BOPD, 33°, Strawn 3,296-99 ft. TD 4,816 ft.

Gwyn Bros. Oil Co. 1 Gwyn, H. Jennings Sur., A-531. Dry. TD 1,566 ft.

Grayson County: Howell, Holloway & Howell 1 McDonald, M. B. Lamar Sur., A-704, ½ mile W Sadler SW field. IPP 93.89 BOPD, 29°, pay 6,332 ft. TD 6,388 ft.

Montague County: Edwin L. Cox 1 Donald,

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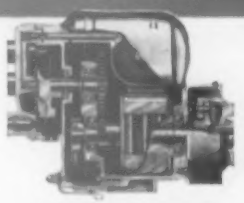

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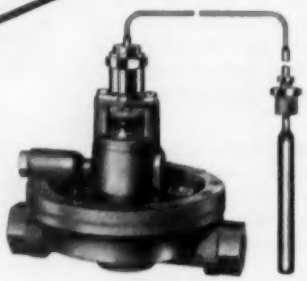

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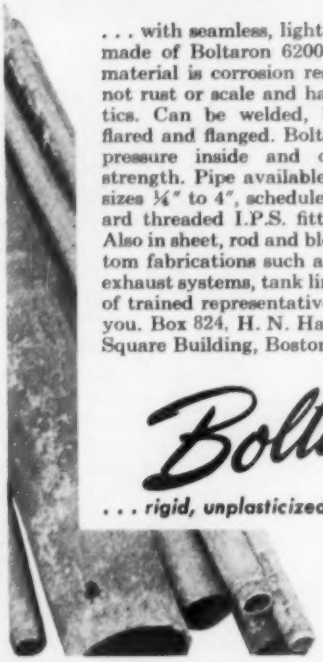

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W. B. Omohundro 1 Maggie Shoemaker, Blk. 34, Panola CSL Sur., 4 miles SE Sunset. IP 128 BOPD, 12/64-in., 40°, TP 240 psi., GOR 660, conglomerate perforations 5,965-75 ft. TD 5,978 ft.

Star Oil Co. 1 Heard-Halbert, Sec. 10, Limestone CSL. Dry. TD 6,460 ft. Elev. 994 ft., Caddo 6,049 ft.

Wichita County: Harry F. Snebold 1 Allison, Sec. 76, RRVL Sur. Dry. TD 1,808 ft.

Wilbarger County: Cox Drilling Co. 1 Potts, Blk. 7, H&TC Sur., A-238, 8 miles W Kamay, (new pay?) IPP 46 BOPD, 40°, GOR 100, perforated 4,143-55 ft. TD 4,155 ft.

Wise County: Christie, Mitchell & Mitchell 1 Fitzgerald, A. Robinson Sur., A-706, 6 miles SW Decatur. IP 2,056 M.f.g., plus 9 bbl. dist. per 1,000 M.f.g., GOR 125, pay 5,277-68 ft. TD 6,354 ft.

Young County: Davis & Gragg 1 Swink, TE&L Sur. 1590, A-932. Dry. TD 1,300 ft.

Davis & Gragg 2 Swink, TE&L Sur. 1590, A-932. Dry. TD 1,290 ft.

A. R. Dillard 2 Barnett & Gibbs, TE&L Sur. 245, A-1078. Dry. TD 2,902 ft.

Engineering Exploration Co. 1 Stovall, TE&L Sur. 2925, A-1195. Dry. TD 3,898 ft.

Frances & Null 1 Pace & Strange, Blk. 3, A. Rohus Sur., A-240. Dry. TD 750 ft.

W. R. Hines 1 Kay, C. F. Fore Sur., A-103. Dry. TD 3,235 ft.

Bill Lisle 1 Clark, TE&L Sur. 199, A-446. Dry. TD 1,100 ft.

Rowan Oil Co. 1 Blount, AB&M Sur., A-1370. Dry. TD 5,185 ft.

WEST TEXAS

Irion County: Thornton Stewart 1 Murphy-Superior, Sec. 53, Washington County RR Sur. Dry. TD 1,868 ft.

Tom Green County: Tennessee Production Co. 1 George Henoir, Absolum Jett Sur. 75½, 5 miles S San Angelo. Dry. TD 6,600 ft.

WEST TEXAS BORDER COUNTIES

Coke County: Sid Katz and White Eagle Oil Co. 1 Copeland, 281-1A-H&TC. Dry. TD 7,052 ft. Elev. 2,154 ft., Cambrian 6,992 ft.

C. L. McMahon, Inc. 1-A Hendry, Rafael Alderete Sur. 470, 3 miles SE Blackwell IPP 83½ BOPD, 45°, top Cambrian pay 5,722 ft. TD 5,727 ft. Elev. 2,414 ft.

Plymouth Oil Co. 2 Hickman, S. A. Maverick Sur. 961, 6 miles SE Robert Lee. IP 299 BOPD, ¼-in., 39°, GOR 113, McCutchen 3,633-42 ft. TD 3,642 ft.

Nolan County: British-American Oil Producing Co. 1-I Wilson, 245-64-H&TC. Dry. TD 6,123 ft.

Marcum Drilling Co. 1 Herndon, R. W. Whitehead Sur. 297. Dry. TD 6,050 ft.

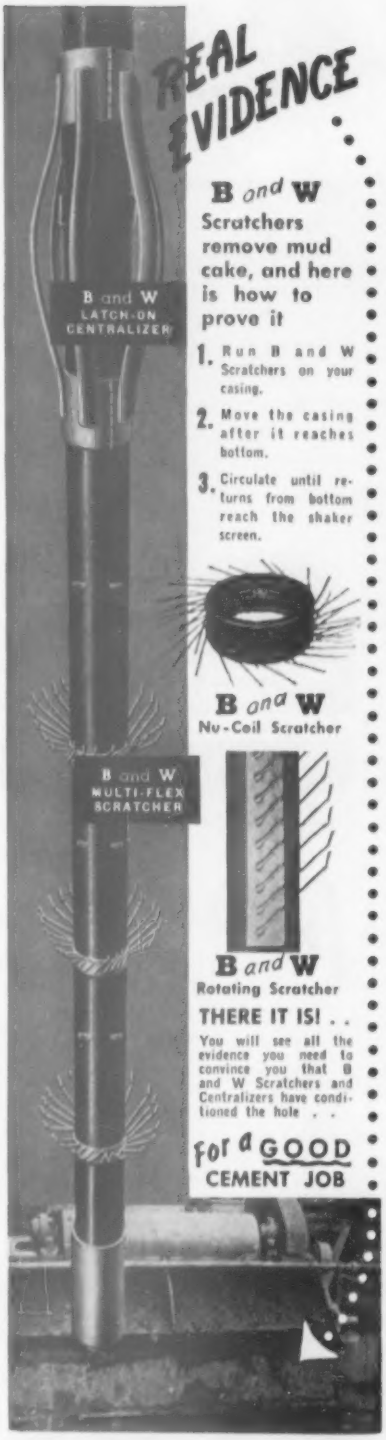
Runnels County: G. W. Strake 1 Hodge, John Early 449 Sur. Dry. TD 5,215 ft.

SOUTHEAST NEW MEXICO

Lea County: G. E. Hall 1-A State, 16-15s-36e, 4 miles W Plainview. IP 552 BOPD, ½-in., 57°, TP 150 psi., GOR?, top Devonian pay 13,463 ft., perforated 13,465-13,510 ft. TD 13,585 ft., elev. 3,912 ft.

NORTHWEST NEW MEXICO

Colfax County: Continental Oil Co. 2 St. Louis, Rocky Mountain & Pacific Co., NW SW SW 26-31n-21e. Dry. TD 7,268 ft. Pre-Cambrian.



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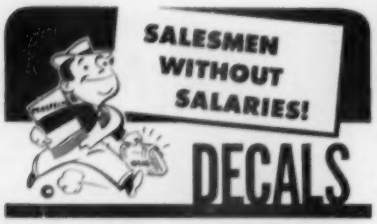

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WILDCAT COMPLETIONS

Rio Arriba County: Humble Oil & Refining Co. 1 Jicarilla, C NW NW 15-23n-5w. IPF 20 BOPD, 50.6°, 875 M.c.f. of gas per day, Dakota discovery, new field. TD 7,658 ft. Entrada.

ILLINOIS

Clinton County: J. F. Dunnill et al 1 McAdams, NE SE SE 28-3n-1w. Dry. TD 1,463 ft.

H. F. Robison 1 Newkirk, SW SE SW 23-3n-2w. Dry. TD 2,725 ft.

Randolph County: Alch Drilling Co. 1 Matthews, NW NW SW 17-4s-6w. Dry. TD 1,902 ft.

St. Clair County: E. E. Rehn 1 Behrens, SW SW NW 33-1s-7w. Dry. TD 2,000 ft.

INDIANA

Clinton County: O. Sheets 1 Slipher, SW NW NE 34-22n-1w. Dry. TD 1,076 ft.

Crawford County: R. Archibald and Phillips 1 Archibald, NW NE NW 25-2s-1e. Dry. TD 1,475 ft.

Daviess County: J. Gambill 1 Malone, NW NE NW 22-5n-5w. Dry. TD 940 ft.

Dubois County: Gale & McDaniel 1 Smith, SW SE NW 12-3s-3w. Dry. TD 1,000 ft.

H. C. Henderson 1 Wilte, SW SW NW 1-3s-5w. Dry. TD 855 ft.

Vail-Muth 1 Meyers, NE SE SW 26-3s-6w. Dry. TD 1,229 ft.

Gibson County: Paco Petroleum Co. 1 Knight-Brakmeyer, NE SW SE 21-2s-10w. Dry. TD 2,120 ft.

Perry County: T. M. Egan 4 American Cannel Coal Co., NE SE NE 9-7s-3w. Dry. TD 810 ft.

Pike County: Olds Oil Co. 1 Sullivan, NE SE NE 19-1s-6w. Dry. TD 1,172 ft.

Sullivan County: Star Oil Corp. 1 Ashmore, SW NW NE 2-8n-9w. Dry. TD 1,376 ft.

KENTUCKY

Daviess County: Ryan Oil Co. 1 Boswell, NE SW NE 3-O-27. Dry. TD 2,300 ft.

Zogg Oil Co. 1 Taylor, SW SE NE 13-Q-30. Dry. TD 1,125 ft.

Henderson County: Delta Drilling Co. 1 Kloke, SE NE SW 13-Q-22. Dry. TD 2,640 ft.

Muhlenberg County: W. Sargent et al 1 Rothert, NW SE NE 10-H-28. Dry. TD 1,618 ft.

C. A. Ritchey 1 Mallory, NE NE SE 20-H-30. Dry. TD 730 ft.

MICHIGAN

Allegan County: Blunt Petroleum Co. & Ford Oil Co. 1 Fishman, SE SE NE 14-2n-15w. Dry. TD 1,321 ft. in Traverse lime.

Issbella County: John Neyer, Ray Miller & Byron Gallagher 1 Hamilton, NW SW SE 19-16n-5w. Dry. TD 3,899 ft. in Dundee.

Kent County: Mackey Drilling Co. 1 Blain, SE NW SW 17-5n-11w. Dry. TD 1,902 ft. in Traverse lime.

Oscoda County: United Drillers & Producers Inc. 1 U. S. A., SE SE SW 19-25n-3e. Dry. TD 4,265 ft. in Richfield.

PENNSYLVANIA

Fayette County, Salt Lick Township: Mid Atlantic Oil & Gas Co. 1 Adolph Dupre. Dry. Chert 8,191-8,355 ft., Oriskany sand 8,355 ft., TD 8,476 ft.

WEST VIRGINIA

Randolph County, Dry Fork district: Columbian Carbon Co. 1-1202 U.S.A., elevation 3,036 ft., 696,000 cu. ft. gas, Oriskany sand 4,854-5,075 ft., gas 4,992-5,023 ft., TD 5,082 ft.

Roaring Creek district, Seneca Gas & Oil Co. 1 D. H. Hill Arnold, elevation 2,338 ft., 55,000 cu. ft. gas, fifth sand 2,076-2,126 ft., gas 2,108 ft. TD 2,289 ft.

ALABAMA

Marion County: J. L. Duffy and Jack Harrington 1 Miller-Childress, C NE SW 12-9s-15w. Dry. TD 150 ft.

MISSISSIPPI

Adams County: Sunnyland Contracting Co. 1-A U.S.A., 51-6n-1w. Dry. TD 6,830 ft. Elev. 249 ft., Wilcox 4,449 ft., base Baker shale 6,263 ft.

Texas Crude Oil Co. and Vasser & Brown, Inc., 1-12 Junkin, 12-8n-3w. Dry. TD 6,123 ft. Elev. 277 ft., Wilcox 3,998 ft., Parker sand 5,886 ft.

Issaquena County: Bush Drilling Co. et al 1 Brock, SW SW SW 6-9n-6w. Dry. TD 5,510 ft. Elev. 100 ft., Lower Cretaceous 5,148 ft.

Jefferson County: F. H. Shortridge and Fortenberry Drilling Co. 1 Jackson, 9-8n-1e. Dry. TD 6,515 ft. Elev. 336 ft., Wilcox 5,741 ft., base Baker shale 5,741 ft.

Lamar County: Molero-Gholson et al 1 Rees, C SE NE 15-2n-14w. Dry. TD 9,012 ft. Elev. 362 ft., lower Tuscaloosa 8,584 ft.

Wayne County: Walter E. Sistrunk and Sunnyland Contracting Co. 1 Lindsey, SW NE NE 35-9n-8w. Dry. TD 5,614 ft. Elev. 302 ft., Eutaw 5,334 ft.

SOUTH LOUISIANA

Evangeline Parish: Vincent & Welch, Inc., 1 Christ, 41-6s-2w. Dry. TD 8,710 ft.

Iberville Parish: F. A. Callery, Inc., 1 Canal Assets, Inc., 69-10s-14e. IP 216 BOPD, ⅛-in., 35.2°, perforations 10,109-13 ft. TD 10,887 ft. (New pay and first oil production in Laurel Ridge field.)

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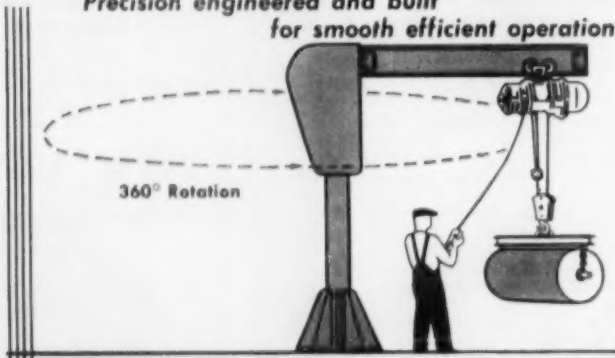

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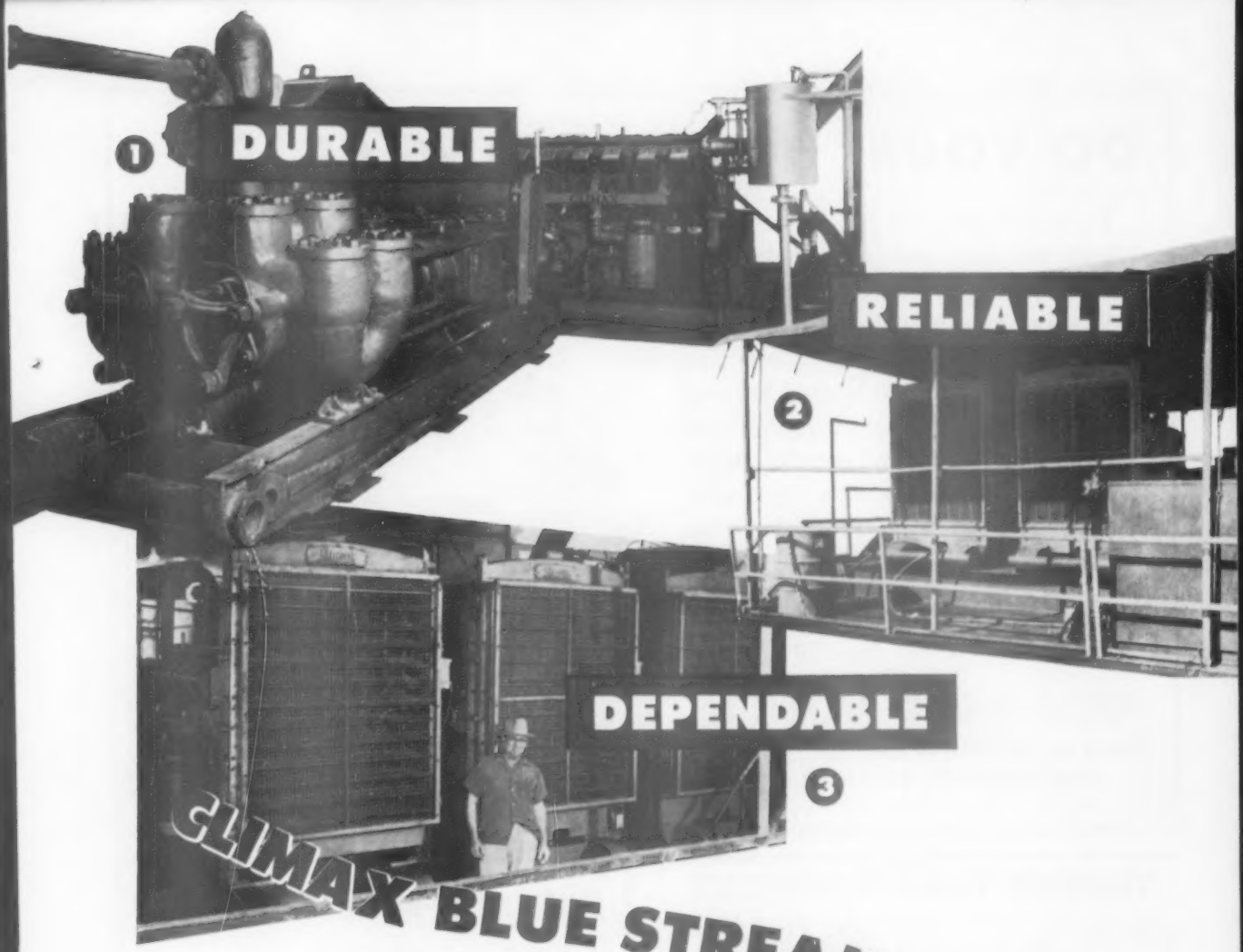

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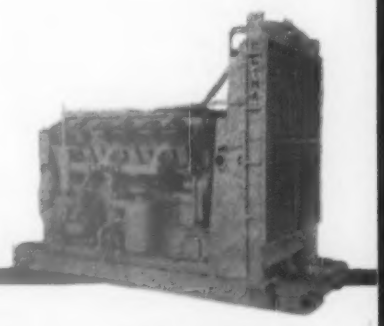

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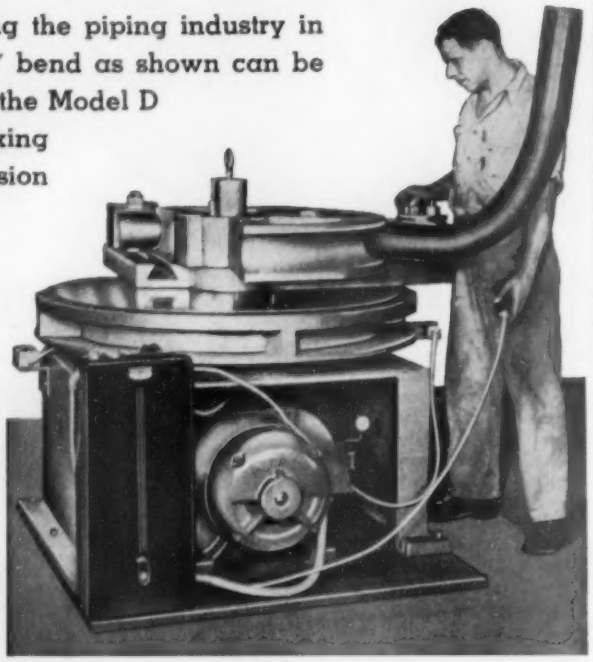

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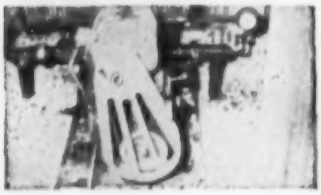

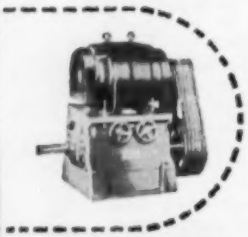

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CENTRAL STANDARD LIFE INSURANCE COMPANY, Chicago, Illinois, will offer for sale, at Public Auction, on December 14, 1954, beginning at 12:01 P.M., Central Standard Time, 18th Floor, 211 West Wacker Drive, Chicago, Illinois, mineral and royalty interests, both producing, and non-producing, held by said Company, consisting of approximately 37,390.74 net mineral acres, a part of which are under lease. These mineral and royalty interests are situated in the following States: Colorado 1,399.15 net mineral acres, Kansas 9,179.35 net mineral acres, New Mexico 720 net mineral acres, Oklahoma 25,524.87 net mineral acres, Texas 567.37 net mineral acres, and will be offered for sale in three separate parcels. Parcel 1, Colorado and New Mexico, Parcel 2, Kansas, Parcel 3, Oklahoma and Texas, or in their entirety as a complete unit. Terms governing the sale with details as to these mineral and royalty interests, the leases and the income therefrom are shown in a booklet which will be sent on request.

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Attention: E. H. Henning, President
211 West Wacker Drive, Chicago 6, Illinois

Gross number of surface acres	76,570.70
Net mineral acres	37,390.74
Number of Counties	70
Number of Tracts	430

WILDCAT COMPLETIONS

Jefferson Parish: Ada Oil Co. 1 Powell, 30-7s-4w. Temporarily abandoned. TD 8,923 ft.

Lafayette Parish: Sunray Oil Corp. 3 McConnell, 8-10s-3e. IP 51 BCPD and 2,770 M.c.f. daily, 10/64-in., 45.3°, perforations 11,058-68 ft. TD 11,600 ft. (New pay in Duson field.)

Lafourche Parish: Hudson Gas & Oil Corp. 1 Hodson, 14-16s-18e. Dry. TD 11,112 ft.

Hassie Hunt trust 1 Binning, 59-15s-17e. IP 30 BCPD and 175 M.c.f. daily, 10/64-in., 53.6°, perforations 10,429-37 ft. TD 13,278 ft.

Plaquemines Parish: California Co. 1 Louisiana Fruit, 28-21s-31e. Dry. TD 13,000 ft.

NORTH LOUISIANA

Bienville Parish: Pure Oil Co. 1 J. B. Smith Unit, 35-17n-7w. IPF 238 BOPD, 20/64-in. 38.5°, GOR 370:1. Pettit 7,022-40 ft. TD 7,102 ft. (Opens Cypress Springs field.)

Concordia Parish: David Crow Trusts et al C-1 Conn, 27-4n-6e. Dry. TD 6,755 ft.

Carter Oil Co. 1 Sharp, 14-4n-9e. Dry. TD 8,000 ft.

LaSalle Parish: Magnolia Petroleum Co. 1 Urania Lumber Co., 13-10n-1e. Dry. TD 4,020 ft.

Sabine Parish: Earl Scheib 1 Burkett, C N½ SE SE 2-9n-13w. Dry. TD 3,228 ft.

OKLAHOMA

Beckham County: Amarillo Oil Co. et al 1 Bohannon, SE NW SE 29-8n-21w. Dry. TD 1,485 ft.

Bryan County: Miller & Wooten 1 Moore, SE SE NW 17-5s-9e. Dry. TD 489 ft.

Carter County: Samedan 2 Howell, NW NE SE 12-2s-3w. IPP 58 BOPD, 4,544-71 ft., 35.5°. TD 5,289 ft. (Geological wildcat in Tatums pool.)

Custer County: Magnolia Petroleum Co. 1 Jones, C SE SE 21-15n-16w. Dry. TD 12,006 ft. Temp. abd.

Garvin County: Vickers Petroleum Co. 1 Green, C NE SW 36-3n-4w. Dry. TD 10,361 ft.

Hughes County: H. A. Roberts 1 Kile, NE NW SE SW 28-5n-9e. Dry. TD 909 ft.

Kay County: Whan & Howard Drilling Co. 1 Anderson, SW NE SW 5-26n-4e. Dry. TD 3,450 ft.

Lincoln County: Jones, Shelburne and Sunray Oil Corp. 1 Roller "B," SE SW NE 14-12n-5e. IPP 17 BOPD, Viola 4,550-64 ft., 37°. TD 4,664 ft. (Oil discovery.)

McClain County: R. E. Hibbert 1 Garrett, NE NE NE 23-6n-2w. Dry. TD 8,347 ft.

Noble County: Roy G. Woods 1 Pipestem, SW SW NE 19-23n-2e. IPF 94 BOPD, Skinner sand 3,900-08 ft., 44°, 22/64-in. TD 4,625 ft. (Oil discovery.)

Okfuskee County: Parham & Seawell Drilling Co. 1 Taylor, SE SE SE 15-13n-10e. Dry. 3,535 ft.

Osage County: Sooner Oil Co. 1 Osage, NW NW NE 7-27n-10e. IPP 46 BOPD, Miss. chat 2,026-44 ft. TD 2,044 ft. (Oil discovery.)

Payne County: J. R. McLean-W. C. McBride, Inc. 1 Miller, NE NE SE 25-19n-2e. Dry. TD 4,186 ft.

KANSAS

Barber County: City Products Corp. 1 Walgamott, C S½ SW NW 16-35s-14w. Dry. TD 5,725 ft.

Butler County: Rex & Morris and Adair 1 Davis, SE SE SE 1-27s-4e. Dry. TD 2,993 ft.

Edwards County: Branine-Hall 1 Kirkman, SW SW SE 10-24s-16w. Dry. TD 4,399 ft.

Decatur County: Sauvage 1 Sauvage, C N½ NE NW 26-3s-29w. Dry. TD 4,120 ft.

Derby Oil Co. et al 1 Skiles, SE SE SW 17-5s-30w. Dry. TD 4,600 ft.

Ellis County: Morrison Drilling Co. et al 1 Schumacher, SE SE SE 1-14s-18w. Dry. TD 1,236 ft.

Graham County: Jones, Shelburne & Farmer 1 Casey, NE NE SE 35-6s-23w. Dry. TD 4,043 ft.

F. B. Anschutz 1 Kenyon, SE SE SE 5-8s-21w. Dry. TD 3,610 ft.

Empire Drilling Co. 1 Legere, SE SE NE 15-8s-23w. Dry. TD 3,902 ft.

McPherson County: Stag Drilling Co. et al 1 Neufeld, C S½ S½ SE 18-21s-5w. Dry. TD 4,034 ft.

Harper County: Appleman 1 McIntire, NE NE SE 1-31s-8w. Dry. TD 4,470 ft.

Pawnee County: Musgrove Petroleum Co. 1 Johnson, SE SE NW 34-20s-19w. Dry. TD 3,296 ft.

Reno County: Greenland Drilling Co. 1 Collingwood, NW NW NE 8-26s-7w. Dry. TD 4,341 ft.

Saline County: Musgrove 1 Everhart, SW SW SE 13-16s-1w. Dry. TD 2,680 ft.

Stafford County: Deep Rock Oil Corp.-Phillips Petroleum Co. 1 Bowker, NE SW SW 35-24s-14w. IPF 135 BOPD, Lansing 3,794-3,803 ft. TD 4,285 ft. (Opens Cephas North pool.)

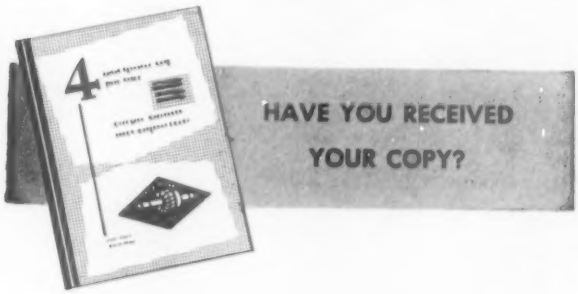
NCRA 1 Lavielle, SE SE NE 24-25s-12w. Dry. TD 4,225 ft.

ARKANSAS

Monroe County: Continental Oil Co. 1 Peters, SE SE SE 32-3s-1e. Dry. TD 4,394 ft.

NEBRASKA

Dawes County: L. A. Helms 1 Metz, SW SE



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THE OIL AND GAS JOURNAL

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WILDCAT COMPLETIONS

SW 14-33n-52w. Dry. TD 3,307 ft. Spearfish.

Kimball County: M. P. Gilbert 1 Smith, NE NE SW 1-14n-55w. Dry. TD 6,162 ft.

Miracle-Fifer 2 Swenson, NE NE NE 23-13n-54w. Dry. TD 6,051 ft.

Morrill County: Dunbar Drilling Co. 1 Nerud, SE SE NW 2-19n-52w. Dry. TD 4,578 ft.

NORTH DAKOTA

Emmons County: Mobil Producing Co. F-22-30-P Kruse, SE NW 30-134n-75w. Dry. TD 4,346 ft. Duperow.

CALIFORNIA

Kern County: Standard Oil Co. 18-21 Tejon 3, 21-11n-18w. Dry. TD 2,726 ft.

Los Angeles County: Standard Oil Co. 1 A. R. Joughin, 23-3n-17w. Dry. TD 3,471 ft.

Merced County: Shell Oil Co. 33X-22 Shell Bliss, 22-9s-14e. Dry. TD 2,500 ft.

Orange County: Action Oil & Devopment Co. Wagner 1-29, 29-3s-9w. Dry. TD 5,410 ft.

Eddie Fisher 2 Exeter-Newland, 12-6s-11w. Dry. TD 6,118 ft.

Sacramento County: Monterey Oil Co. 1 Monterey-Humble-Wright, 9-9n-4e. Dry. TD 5,550 ft.

San Benito County: Artnell Oil & Gas Co., Inc. 2 Rudolph, 4-18s-9e. Dry. TD 2,666 ft.

Santa Barbara County: The Texas Co. 1 Irma Wilson, 26-8n-34w. Dry. TD 4,509 ft.

Tulare County: Farmers Gas & Oil Co. and Elmer V. Von Glahn, Operator 1 Sawyers, 9-24s-23e. Dry. TD 3,700 ft.

Neaves Petroleum Developments 1 Boesch, 2-22s-27e. Dry. TD 950 ft.

Skay Exploration, Ltd. 2 Skay, 28-24s-28e. Dry. TD 884 ft.

Ventura County: Superior Oil Co. 1 Ventura Farms, 18-2n-19w. Dry. TD 4,520 ft.

MONTANA

Blaine County: True & Brown 1 Hiller, C NW NE 33-32n-18e. Dry. TD 4,031 ft. Mission Canyon.

Musselshell County: Amerada Petroleum Corp. 1 NP "D," C SE NE 17-10n-26e. Dry. TD 3,914 ft. Amsden.

Pondera County: The Chicago Corp. and Republic Natural Gas Co. 1 Nelson, C NW NW 10-30n-4w. Dry. TD 2,628 ft. Madison.

WYOMING

Crook County, Grasshopper Butte: M. D. Miller 1-A Robinson, SW NE SE 25-50n-67w. Dry. TD 2,168 ft. Newcastle.

Natrona County, North Boone Dome: Farmers Union Central Exchange 1 Government-Ames, C SE SW 28-36n-85w. Dry. TD 7,805 ft. Tensleep.

Bates Creek: Dan C. Morton 1 Government-Stout, NE NE 2-31n-81w. Dry. TD 1,300 ft. Muddy.

Washakie County: Cyprus Mines 1 Muirhead, NE NE SE 25-43n-90w. Dry. TD 4,606 ft. Tensleep.

Weston County: Empire Oil Co. 1 Rosean, CE SE SE 15-43n-61w. Dry. TD 2,985 ft. Morrison.

UTAH

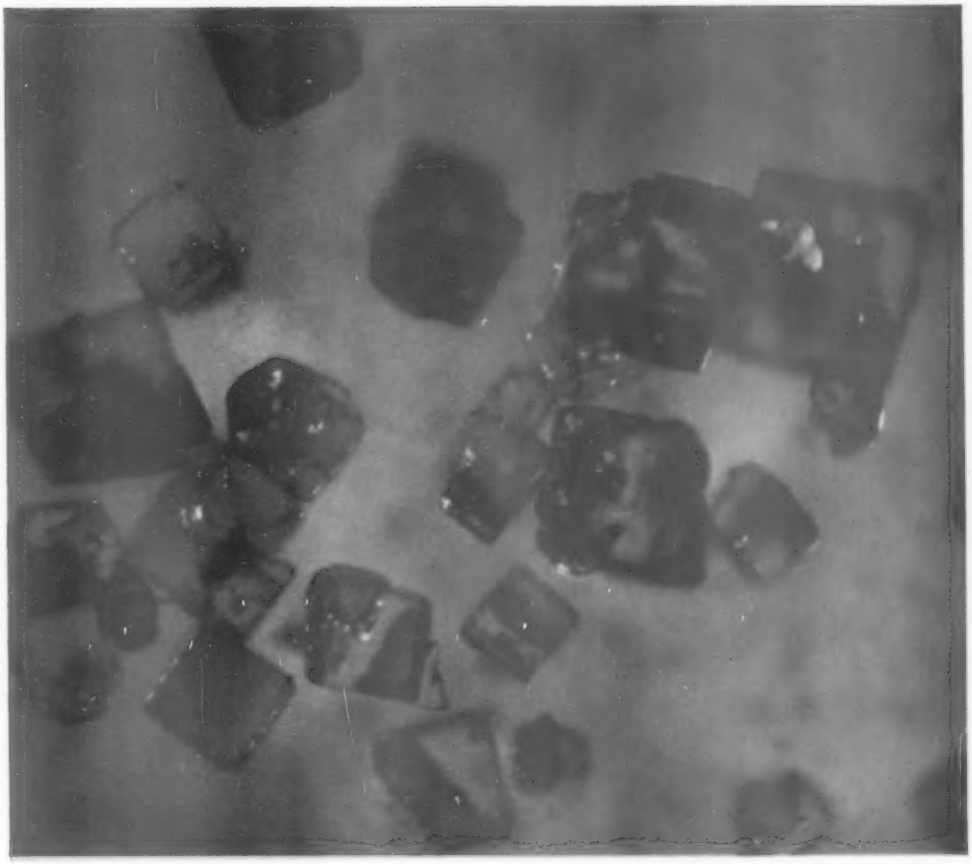
Daggett County, Carson Peak: Carter Oil Co. 1 Unit, C NE NE 22-3n-18e. Dry. TD 11,000 ft. Mesaverde.

Emery County, Kane Springs: P. B. English 1 Moore, SE NE 6-24s-15e. Dry. TD 2,370 ft. Marine Moenkopi.

San Juan County, White Mesa: Carter 1

(Continued on page 290)

Refinery Poison



Photomicrograph by J. G. Suthard

Salt crystals in crude oil, magnified 70X, look like this. Regardless of how they look, they're poison in your charging stock . . . they'll evolve into corrosive HCl; they'll plug tower trays, condensers and exchangers; they'll salt-up furnaces and heaters. In a refinery, they're strictly poison.

But salt doesn't have to be poison

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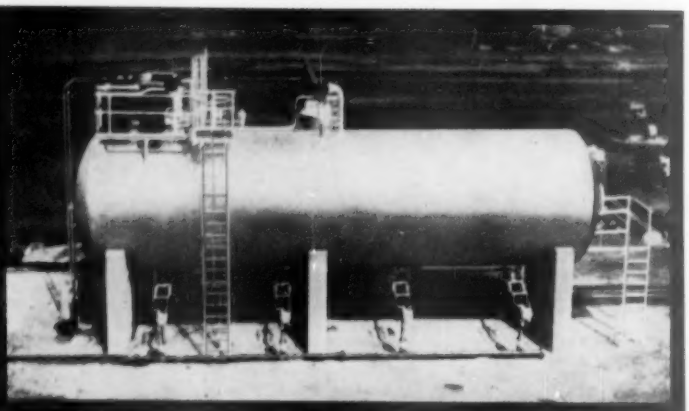
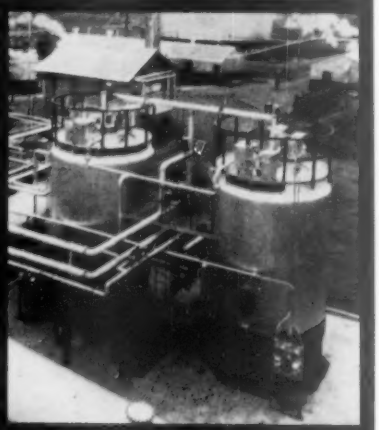
ELECTRIC DESALTING

keeps it out, along with solids and other impurities

B54-3

The photomicrograph on the reverse of this page was taken as a phase of the Petreco research program; a program dedicated to a continuing battle against salts in crude oil, and to the elimination of troubles and problems derived from them. At Petreco we believe that these many years of research effort directly benefit our customers, and in a broad sense, the entire refining industry. Petreco pioneered electric desalting and has spent countless man hours on process development and improvement. Doesn't it stand to reason then, that in desalting, your best buy is Petreco?





Leading refiners everywhere rely on Petreco Electric Desalting to keep their refineries free from salt and the difficulties which accompany it. These many Petreco customers have learned that the Petreco objective is to design and build for its customers the best desalting equipment obtainable.

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PERSONALS

Never Too Busy

Knebel, Jersey exec., finds time for outside pursuits

MOSE KNEBEL has spent most of his working hours lately doing what he calls "putting out fires."

By fires, he means all the problems that arise in managing the exploration division of the producing coordination department of Standard Oil Co. (N. J.). Also needing some "putting out" are the many additional jobs that fall to a man of Knebel's rank.

At present, these include: serving as general arrangements chairman for the forthcoming New York convention of American Association of Petroleum Geologists; writing occasional articles; and being a candidate for the A.A.P.G. presidency in 1955.

Knebel spends his working day on the twenty-seventh floor of the RCA Building directing his department in the studying and reporting of oil developments all over the world.

Nicknamed Mose . . . George Moses Knebel, always called Mose by his friends, has two characteristics which identify him anywhere. One is his fondness for a large, clear Havana cigar, which he holds at a jaunty, acute angle; and the other is his expression "red flags," which he uses to point out plain indications of undiscovered oil deposits.

Knebel is enthusiastic about the future of oil exploration and his own profession of geology. He feels estimates of reserves are on the conservative side, but that the 5 per cent annual increase in world consumption—equal to 600,000 bbl. daily—demands that no letup in exploratory effort take place.

For the young geologist with his recent-won degree, Knebel advises postgraduate work and more field training during the summer months. Four years of geology to him are just enough to master the fundamentals.

Born in Waco, Tex., 55 years ago, Knebel decided on geology as a career and was graduated from University of Texas in 1922. Hard times had moved in temporarily then, and he had an unsuccessful search job hunting. However, he finally landed a job with his cousin, the late Floyd C. Dodson, an independent at San Angelo, Tex. Later that year, he left Dodson and went to Gulf Production Co.

Job folded . . . This job lasted for only a short time before Gulf reduced its personnel. Knebel then joined Freeport Sulphur Co. It was here that he had a chance to study the superheated water recovery method used in sulfur extraction, which he now is interested in applying to the recovery of certain heavy crudes.

In 1924, Knebel joined the Jersey Standard organization with Humble Oil & Refining Co. in East Texas. While there, he became an expert on the geology of East Texas and was one of the first to recognize the phenomenon of rim synclines around shallow salt domes.

Knebel went to Venezuela in 1930 and in 9 years he advanced from chief geologist to director to assistant manager to vice president and manager of Standard Oil Co. of Venezuela, the former operating company of Creole Petroleum Corp.

Latin American experience has long been a standard route taken by future Jersey Standard executives and in 1939, his training over, he returned to the United States and an executive position in the producing department. In 1944, he was appointed manager of the exploration department. Recently, in addition to his other duties, he was given the somewhat nominal job of president of Esso Standard (Turkey), Inc., the operating company for Jersey's forthcoming exploration in Turkey.

Knebel lives in Scarsdale in suburban New York City. Mrs. Knebel is the former Carolyn Gladdish, of Mart, Tex. They were married in 1923 and now have a grown son and married daughter. Knebel is an ardent fisherman and hunter. He has hunted caribou in Newfoundland and chamois in Switzerland, and has fished many of the waters of the western states and Canada.

Frank Devlin has been transferred to Midland, Tex., as assistant district geologist by Sunray Oil Corp. Devlin formerly was with Sunray as a geologist at Albuquerque.

Jerry D'Arcy has been named manager of Arrow Drilling Co. Canada, Ltd., a subsidiary of Arrow Drilling Co. Before his promotion, D'Arcy served as manager of Oklahoma, North Texas, and Kansas area for Arrow. D'Arcy is well known in sports circles, having been an assistant coach of University of Tulsa's 1953 'Gator Bowl team.

Zeb Mayhew has been appointed deputy coordinator of all producing activities of Standard Oil Co. (N.J.). Mayhew joined the Jersey organization in 1937 as a helper on a drilling rig shortly after his graduation from Princeton University with a bachelor's degree in geology. From 1939 until 1953, he was with Creole Petroleum Corp., first as a geologist and later as district superintendent of the fields at Cumarebo and La Salina in Venezuela. Mayhew came to the producing coordination department in New York in 1953 as a regional executive concerned with Latin America.

M. A. Pyeatt has been promoted to district superintendent at Wichita Falls, Tex., by General American Oil Co. of Texas. Before his promotion, Pyeatt was superintendent with General American at Anson, Tex.

Mitchell Light has joined California Research Corporation as a research geologist at La Habra, Calif. Before joining California, he was an assistant professor at the University of Massachusetts.

Joseph R. Mares, former vice president and general manager of Monsanto Chemical Co.'s Texas City, Tex., operations, has opened industrial chemical consulting offices in Dickinson, Tex.

Harold Rudel of Sun Oil Co., Mount Pleasant, Mich., has been elected to the board of directors of the Oil and Gas Association of Michigan. **Noah Andrews,** Union Rotary Corp., Mount Pleasant, and **W. C. (Top) Taggart,** independent producer, of Big Rapids, were also elected to the board. Officers reelected to the board are: **J. P. Dunni-**

PERSONALS

gan, W. F. Elting, H. H. Fruechtenicht, Earl G. Hartman, J. Walter Leonard, H. M. McClure, Jr., Don Rayburn, John P. Smoots, J. E. Sprindle, R. L. Tope, and I. W. (Jack) Wheland.

E. L. (Dick) Anders, Jr., has resigned as chief engineer for the SACROC Unit in Snyder, Tex., and has gone into business as a consulting engineer in Abilene, Tex. Before joining SACROC in July 1953, Anders served with International Petroleum Co., Ltd., in Talara, Peru, from June 1951 to 1953. From 1948 to 1951, he was associate professor of petroleum engineering at University of Kansas, and before going to Kansas, he served with Creole Petroleum Corp. in Caracas, Venezuela.

Dan F. Furse, former production foreman for Amerada Petroleum Corp. at Forsan, Tex., has been transferred to a similar position at Lovington, N. M.

H. F. Fowler, geologist with Gulf Refining Co., has been transferred from Shreveport to Houston. **Richard A. Sikes,** also a geologist, has been transferred from Houston to Lake Charles, La.

William G. Welch has joined Sinclair Refining Co. at its East Chicago, Ind., refinery as assistant chief inspector. Welch was an inspection engineer with Pure Oil Co. in its refinery at Toledo before going with Sinclair.

Dr. A. J. Deutschman, Jr., has been promoted from assistant director of research and development to director of chemical research by Spencer Chemical Co. Deutschman joined Spencer in 1947 and is presently located at the company's Jayhawk Works at Pittsburg, Kans. **Dr. T. R. Hopkins** has joined Spencer at Pittsburg as group leader in the chemical research department.

William T. Stokes has been promoted by Bright & Schiff, Dallas independent oil firm, from geologist at San Antonio to exploration manager for the company in the West Texas-New Mexico area with headquarters at Midland, Tex. Prior to joining Bright & Schiff, Stokes worked for Sun Oil Co. as a development geologist in South Texas and for Pure Oil Co. as an exploration geologist in Midland and Tyler, Tex.

Seth L. Lobdell, surface geologist with Sun Oil Co., has been transferred from Socorro, N. M., to Eastland, Tex.

H. Donald Borger has been elected executive vice president of Peoples Natural Gas Co., of Pittsburgh. Borger joined Peoples in 1921, and was elected vice president and treasurer in 1951.

A. R. Patten, Jr., chemical engineer with The Texas Co., has been transferred to Port Arthur, Tex., from Casper, Wyo.

Harold A. Randolph has been named district superintendent of production for the Houston district by Sinclair Oil & Gas Co. Before moving to Houston, Randolph was district superintendent for Winkler County, Texas.

W. M. Paggi has been appointed regional superintendent of the operating department at Houston by Sun Oil Co. Paggi, former assistant superintendent at Houston, succeeds **J. O. McPherson,** who retired recently after 45 years' service.

K. A. Gorton has been named chief geologist for Mobil Producing Co. at Billings, Mont. Gorton will handle activities for the United States operations of the firm. **P. R. Tetrick,** district geologist at Bismarck, N. D., has been transferred to Basin, Wyo., as district geologist for Big Horn Basin district, replacing **Loy Harris,** who has resigned, and **John Magee** has been named district geologist at Bismarck.

Victor V. Horner has been named research engineer in the drilling methods of Carter Oil Co. research laboratory. Horner first joined Carter in 1935 as a petroleum engineer and was district petroleum engineer at Powell, Wyo. He joined Baroid Sales Division of National Lead Co. in 1945. He served with Baroid 8 years before he joined Don Johnston Drilling Co., of Denver, as division engineer and secretary-treasurer.

S. A. Hallberg has been named superintendent of the Minneapolis division of the supply and transportation department of Standard Oil Co. (Ind.). Hallberg served as superintendent of the projects and materials division of the products pipeline department in the company's general offices at Chicago before his transfer. **E. R. Carmody** has been named to succeed Hellberg. Carmody was in the operating division of the products pipeline department before his advancement.

Lawrence P. Works, Jr., has been transferred to Seminole, Okla., as a geologist by Gulf Oil Corp. Works was a geologist with Gulf Refining Co. in Salt Lake City.

Jean Nougaro, head of the drilling department of Societe d'Etudes Petrolieres (French Institute of Petroleum), recently returned to Paris after spending a month in the United States observing field developments in Illinois and visiting laboratories in Houston, Tulsa, San Francisco, and Los Angeles.

Charles Fitzgerald, veteran vice president and director of Sinclair Pipe Line Co., has retired after 33 years with the company and its predecessors. He began his career in 1921 and served in various pipeline positions before being named vice president in charge of Texas division of Sinclair Pipe Line in 1951.

Harry P. Dreher, Jr., has been promoted to district engineer by Sohio Petroleum Co. at West Edmond Hunton Lime Unit in Oklahoma. Before his advancement, Dreher was an engineer with Sohio at Centralia, Ill.

S. Z. Natcher has been named president of California Iran Oil Co., Ltd., the Standard Oil Co. of California and Iranian trading company, organized under terms of the recent agreement between the Iranian Government and the eight-company international oil consortium. Natcher was recently appointed resident manager for Standard California in London.

John Sloat, former manager of Pacific Coast division of Union Oil Co., has been appointed to the administrative staff of the company's western area exploration department, which covers the Pacific Coast, Rocky Mountains, Canada, and unassigned areas. **Charles F. Manlove** and **Edward W. Scott** also have been appointed to the administrative staff. Other changes in the company's exploration department are: **John E. Kilkenny,** named chief geologist, Pacific Coast division; **Fred W. Bush,** appointed manager of lands for

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PERSONALS

Pacific Coast and unassigned areas; and **W. E. Morgan,** named manager of operations, Rocky Mountain division.

R. M. Rodriguez has joined Dow Chemical Co.'s Texas division at Freeport as a civil design engineer.

H. Morris, former production foreman for Texas Petroleum Co. in Venezuela, has been transferred to the domestic producing department of The Texas Co.

Luther E. Petty, junior mechanical engineer with Stanolind Oil & Gas Co., has been transferred to Tulsa from Andrews, Tex., where he was serving as a junior petroleum engineer.

Howard D. Hartough has been named to conduct research on new petrochemicals and catalysts at the Marcus Hook, Pa., laboratories of Houdry Process Corp.

Glen Eckel has been named vice president of Dorchester Corp. The firm is a wholly owned subsidiary of Oil & Gas Property Management, Inc., of Dallas, and operates property bought from Panoma Corp. several months ago for over $118,000,000.

F. Hugh Wilson has been named geologist for the southern division of Tide Water Associated Oil Co. The division covers the Gulf Coast area from Texas to Florida. **K. A. Schmidt,** acting division geologist, was placed in charge of offshore geological operations.

George W. Walters, formerly contact man for Great Western Drilling Co., Midland, Tex., has been elected vice president of the firm and promoted to manager of its drilling department. Walters joined Great Western in April 1951, resigning a position as division manager of the Louisiana-Mississippi division of Mid-Continent Supply Co. at Shreveport.

J. A. Rueff, general foreman in the light oils projects division of Whiting refinery, and **R. E. Butikofer,** heavy oils and chemical planning supervisor in the manufacturing department's planning division, have been named head engineers of project engineering of the general engineering department by Standard Oil Co. (Ind.). **J. R. Cherer, R. O. Luetzelschwab,** and **S. R. Wells, Jr.,** all assistant general foremen in Whiting refinery's projects division, have been appointed assistant head engineers of project engineering in the general engineering department.

W. A. Patterson, Jr., has been named drilling engineer for Signal Drilling Co., and Signal Exploration, Inc. Patterson will headquarter in Casper, Wyo., where he will assist **D. E. Bland,** drilling superintendent for both companies. Patterson previously served with Phillips Petroleum Co., and Lakota Petroleum Corp. before joining Signal companies.

PATTERSON, JR.

Ben H. Anderson has been named manager of drilling and production by Oceanic Oil Co. He joined Oceanic after being associated with Continental Oil Co. for 20 years, 5½ years as regional manager of production of the western region, including production operations in California and exploratory drilling in Nevada.

B. W. Miner has been promoted by Gulf Oil Corp. from assistant civil engineer to civil engineer of the company's Fort Worth production division. **C. F. Wilson,** formerly civil engineer in charge of surveying, has been promoted to replace Miner as assistant division civil engineer, and **J. S. Teague** will replace Wilson. Miner replaces **T. J. Dwyer,** who retired recently, as division civil engineer.

J. D. Davis, superintendent of western division of United Gas Pipe Line Co., has been elected a director of United Gas Corp. Davis, who has been with United and a predecessor company more than 30 years, has held various supervisory positions with the firm.

R. B. KELLY

Raymond B. Kelly, vice president for exploration and production of Pure Oil Co., has been elected to the board of directors. Kelly succeeds **Comer Plummer** of Asheville, N. C., who resigned. Kelly has been with Pure for 29 years.

A. P. Loskamp, Los Angeles consulting geologist, has joined Plymouth Oil Co. at Midland, Tex., as chief geologist. Loskamp, except for the past year in Los Angeles, had worked in West Texas since 1926. He entered the area that year as district geologist at Midland for Barnsdall Oil Co., and later joined Union Oil Co. of California's Midland exploration department. He resigned from Union in 1950 as manager of operations for the company's West Texas division to become a consulting geologist at Midland.

Millard F. Westfall has been promoted to acting production superintendent by Husky Oil Co. Westfall, who has been assistant production superintendent for Husky since January 1952, succeeds **John R. Yoder,** who has been transferred to Israel in charge of drilling operations for Israel-American Oil Corp. Before he joined Husky, Westfall served as district engineer for Cities Service Oil Co. at Graham, Tex.

Max C. Sons has been promoted to assistant chief of research of Carter Oil Co.'s research laboratory. Sons will direct over-all activities of drilling research and recovery methods sections. **P. D. Baker** has been named to succeed Sons as chief petroleum engineer for Carter, and **G. C. Hollinger,** southern division engineer, will become assistant chief petroleum engineer. **Marshall A. Jeffers** has been named southern division engineer to succeed Hollinger.

DEATHS

A. V. Forbes, 60, died recently in Reseda, Calif. He was office manager at Standard Oil Co.'s (Ind.) refinery at Casper, Wyo., for 30 years before he retired in 1950.

Robert L. Wyckoff, Independence, Kans., drilling contractor, died recently at his home after suffering a heart attack.

Elliott S. Taxman, 47, owner of Taxman Oil Co., was killed October 29 when the car he was driving struck a truck near Kansas City. The company has production in Texas, Kansas, and North Dakota.

Dale Moore, 56, Houston independent producer, died recently in a Houston hospital from pneumonia. Moore entered the oil business in Tulsa, and at one time was one of the biggest oil brokers in the world.

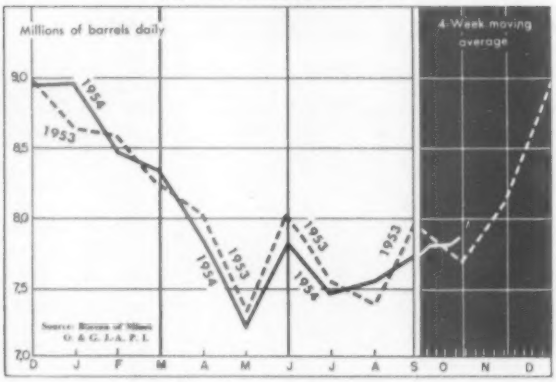
Tyson Cleary, 59, executive manager of the Thomas D. Humphrey oil interests in Dallas, died in Dallas October 25.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,164,525	DOWN	20,400	DOWN	71,309
Crude stocks	273,295,000	UP	2,234,000	DOWN	13,622,000
Completions	1,007	UP	18	DOWN	68
Refinery runs	6,897,000	DOWN	31,000	UP	30,000
Gasoline stocks	149,789,000	DOWN	45,000	UP	8,497,000
Four-product stocks	381,464,000	UP	844,000	UP	16,645,000
Total imports	970,600	DOWN	113,400	DOWN	119,200

TOTAL DEMAND – ALL OILS



Origin of Imported Crude Changed Little in First 8 Months of 1954

THERE were no important shifts in the origin of crude imported into this country in the first 8 months of this year. Receipts from Latin-American countries increased slightly to more than offset the small loss by the Middle East, but the changes were much too small to indicate a trend.

Crude from Latin-American countries averaged 387,930 bbl. daily for the January-August period compared with 368,860 bbl. daily for the same months last year. However, that gain was not enough to bring the average up to the 1952 level.

Imports from the Middle East averaged 211,020 bbl. daily this year, down 9,700 bbl. daily from last year's record.

Largest gains for crude imports from both the Middle East and Far East were in 1953. Receipts from the Middle East during the first 8 months of that year averaged 86,740 bbl. daily more than in the same period of 1952. Crude from the Far East gained 29,410 bbl. daily.

Averages for countries and areas, covering the past 4 years, are shown in the accompanying table.

The increase in crude from Venezuela may account for some of the shift to lower-gravity crudes this year. For the first 8 months of 1954, crude under 25° represented 19.04 per cent of total crude imports compared with 15.36 per cent for the same period last year.

Imported crude was broken down into two groups in October 1952 by the Bureau of the Census. Since that time crude has been classified as under 25° or 25° and over. The heavy-crude portion has reached 20 per cent of the total in only 3 months since the classification was started, and all of these months have been in 1954.

The range for heavy crude has been from 11.3 per cent of total crude imports in March 1953 to 23.0 per cent in August 1954.

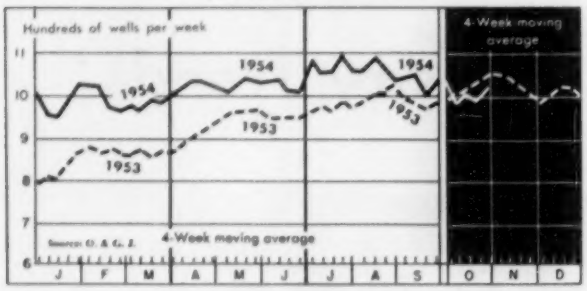
CRUDE IMPORTS

(First 8 Months of Each Year)

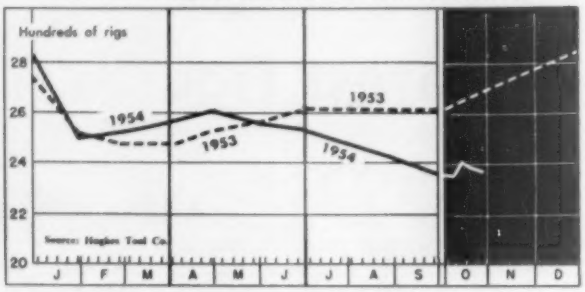
(Barrels daily)

Origin—	1954	1953	1952	1951
Mexico	10,520	13,710	21,440	33,350
Colombia	39,170	43,370	44,810	46,500
Venezuela	335,910	311,780	323,540	294,210
Peru	1,020			
Trinidad	940			910
Ecuador	370			
Total Latin America	**387,930**	**368,860**	**389,790**	**374,970**
Kuwait	111,400	102,880	66,820	69,280
Saudi Arabia	85,350	106,440	66,110	55,140
Iraq	6,910	4,870		
Qatar	7,360	6,530	1,050	
Total Middle East	**211,020**	**220,720**	**133,980**	**124,420**
Canada	**5,190**	**6,150**	**4,070**	**200**
Far East	**38,480**	**38,770**	**9,360**	**8,800**
Total	**642,620**	**634,500**	**537,200**	**508,390**

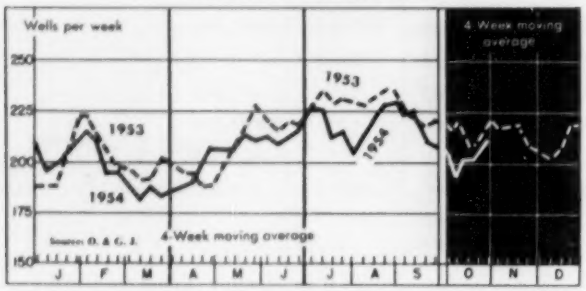
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES.



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

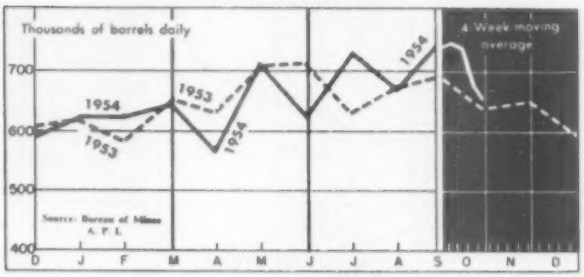
Area—	11-1-54	Change from 10-25-54	Change from 11-2-53
Gulf Coast	520	—10	— 79
N. and W. Texas-New Mexico	723	—14	— 97
Arkansas-N. Louisiana-E. Texas	177	2	— 13
Oklahoma	289	6	— 58
Kansas-S. Nebraska	156	2	— 4
Illinois-Eastern	134	3	— 13
Rocky Mountain	241	—10	— 56
Pacific Coast	131	— 1	— 30
Total United States	2,371	—22	—350
Western Canada	171	8	15

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 30, 1954

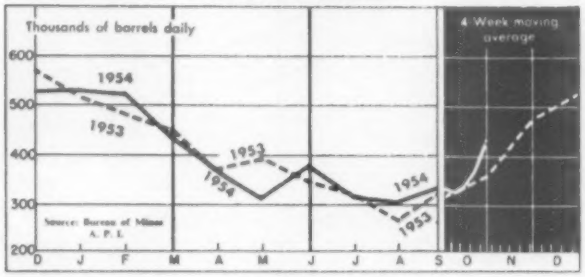
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1954				
	Comp.	Oil	Gas	Dry	Footage	1954	1953	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	150	90	118	0	0	0	1	1	2	0	2	78	82
Arkansas	14	7	0	7	48,715	541	467	0	0	0	1	1	21	0	4	99	124
California	51	34	1	16	229,454	1,972	2,125	0	0	0	12	12	50	1	11	434	496
Colorado	23	8	0	15	132,241	1,083	586	1	0	0	12	13	29	0	15	453	497
Illinois	42	17	0	25	90,955	2,549	1,685	0	0	0	4	4	18	0	1	355	374
Indiana	24	6	0	18	30,559	667	1,082	0	0	0	10	10	9	0	1	129	139
Kansas	91	46	5	40	326,710	3,776	4,096	1	0	0	15	16	71	0	20	508	599
Kentucky	30	9	8	13	56,399	947	938	0	0	0	5	5	15	0	4	101	120
Louisiana	69	47	7	15	374,569	2,922	2,348	2	0	2	8	12	92	46	33	294	465
North	43	36	1	6	116,613	1,617	1,024	1	0	0	4	5	17	3	12	126	158
South	26	11	6	9	257,956	1,305	1,324	1	0	2	4	7	75	43	21	168	307
Michigan	12	6	0	6	42,227	473	509	0	0	0	4	4	14	0	0	173	187
Mississippi	13	4	0	9	94,717	353	325	0	0	0	6	6	10	1	0	129	140
Montana	7	2	1	4	25,261	268	352	0	0	0	3	3	6	0	2	91	99
Nebraska	14	6	0	8	77,249	365	273	0	0	0	4	4	21	0	3	114	138
New Mexico	20	10	4	6	144,085	903	1,200	2	1	0	2	5	17	1	17	90	125
North Dakota	4	3	0	1	30,435	251	222	0	0	0	1	1	4	0	0	93	97
Ohio	0	0	0	0	0	937	920	0	0	0	0	0	3	0	5	13	21
Oklahoma	133	90	6	*37	444,931	7,472	6,322	4	0	0	10	14	112	3	21	548	684
Pennsylvania-New York	34	10	10	†14	125,576	1,906	1,835	0	0	0	1	1	0	0	6	34	40
Texas	371	221	21	129	1,506,713	15,428	14,334	10	1	4	67	82	651	63	146	3,477	4,337
Southwest (1 & 4)	49	28	4	17	212,411	2,177	2,324	0	1	0	10	11	91	25	38	589	743
Gulf Coast (2 & 3)	44	25	5	14	295,442	2,212	2,108	1	0	2	7	10	68	32	44	554	698
East (5 & 6)	18	15	0	3	101,888	810	676	1	0	0	0	1	17	0	13	238	268
North Central (7-B & 9)	182	96	2	84	521,849	5,833	5,458	6	0	2	45	53	297	4	20	1,412	1,733
West (7-C & 8)	56	46	0	10	306,983	3,570	3,124	2	0	0	4	6	173	0	22	611	806
Panhandle (10)	22	11	10	1	68,140	826	644	0	0	0	1	1	5	2	9	73	89
Utah	5	0	0	5	35,293	70	59	0	0	0	5	5	3	0	1	43	47
West Virginia	12	1	10	1	33,263	507	503	0	0	2	0	2	0	0	30	15	45
Wyoming	29	18	0	11	146,842	1,060	677	0	0	0	5	5	32	0	6	161	199
Miscellaneous (Mo.)	8	0	0	8	6,431	105	65	0	0	0	0	0	3	0	0	28	31
Total United States	**1,007**	545	73	389	4,002,775	44,645	41,041	20	2	8	176	**206**	1,183	115	328	7,460	9,086
Total previous week	989	498	67	424	4,004,591			24	1	7	186	218	1,163	113	320	7,284	8,880
Total October 31, 1953	1,075	598	65	412	4,288,552			25	1	4	187	217	1,243	90	318	7,672	9,323

Service wells included: *1, †8.

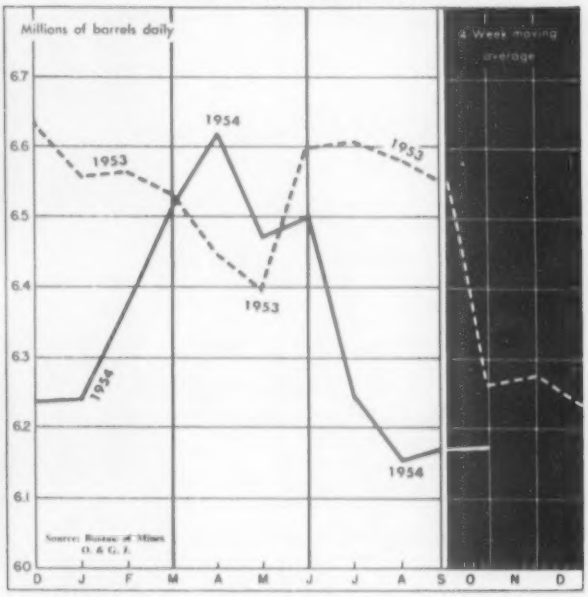
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

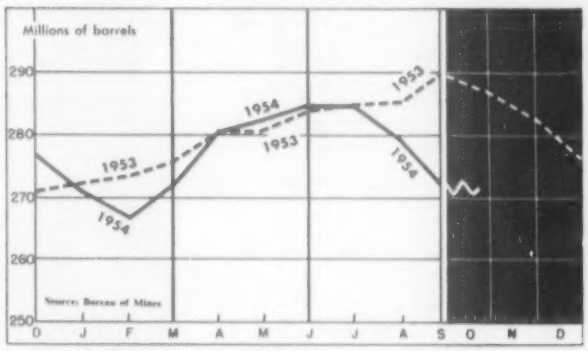


DAILY AVERAGE PRODUCTION FOR WEEK

	October 30			Oct. 23
	Crude oil	Lease condensate	Total	total
Alabama	4,300		4,300	4,200
Arkansas	72,050	450	72,500	71,800
California	960,100		960,100	960,800
Colorado	137,200		137,200	136,000
Eastern	50,000		50,000	53,500
Florida	1,575		1,575	1,575
Illinois	184,400		184,400	184,800
Indiana	27,700		27,700	29,100
Kansas	320,300		320,300	319,400
Kentucky	37,100		37,100	37,500
Louisiana	582,900	41,600	624,500	624,900
North	102,900	2,600	105,500	105,900
South	480,000	39,000	519,000	519,000
Michigan	31,100		31,100	31,400
Mississippi	88,100	3,000	91,100	90,300
Montana	42,700		42,700	40,900
Nebraska	19,200		19,200	18,800
New Mexico	204,425	2,250	206,675	206,775
North Dakota	16,100		16,100	15,200
Oklahoma	483,700		483,700	499,500
Texas	2,550,000	47,575	2,597,575	2,597,575
Dist. 1	42,400	400	42,800	42,800
Dist. 2	129,500	7,550	137,050	137,050
Dist. 3	398,800	22,300	421,100	421,100
Dist. 4	226,000	5,300	231,300	231,300
Dist. 5	42,500	425	42,925	42,925
Dist. 6	107,000	4,600	111,600	111,600
East Texas field	203,800		203,800	203,800
Dist. 7-B	134,000	25	134,025	134,025
Dist. 7-C	171,000	4,600	175,600	175,600
Dist. 8	820,000	2,000	822,000	822,000
Dist. 9	188,000	350	188,350	188,350
Dist. 10	87,000	25	87,025	87,025
Utah	5,200		5,200	5,100
Wyoming	251,200		251,200	255,400
Miscellaneous	‡300		‡300	‡400
Total U. S.	6,069,650	94,875	**6,164,525**	6,184,925
Change from previous week, down			**20,400**	
Canada	†281,250		†281,250	†278,800
Total U. S. production January 1-October 30			1,919,129,650 bbl.	
Same period last year (crude plus cond.)			*1,971,810,529 bbl.	

*Includes 27,471,600 bbl. condensate. †Week ended previous Monday. ‡Includes S. D. 100, Nev. 200.

CRUDE-OIL STOCKS

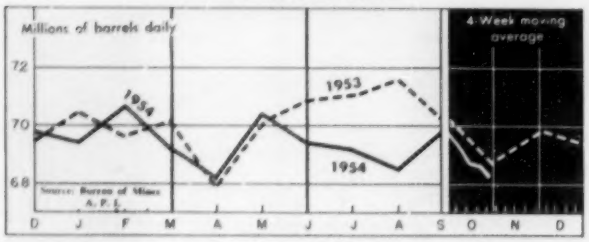


CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

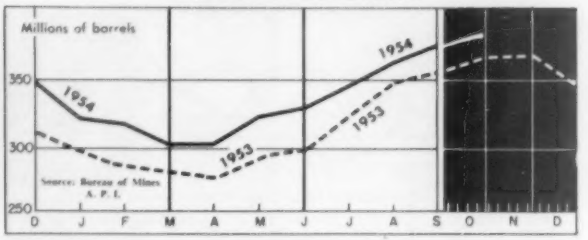
	Oct. 23, '54	Oct. 16, '54	Oct. 24, '53
Pennsylvania Grade	3,202	2,966	2,944
Other Appalachian	1,843	1,588	2,066
Illinois, Indiana, Michigan	12,706	12,569	12,628
Nebraska, North Dakota	2,032	2,331	(‡)
Kansas	8,469	8,326	10,240
Oklahoma	26,707	25,169	30,722
Arkansas	3,006	3,636	3,344
Louisiana	14,617	15,055	17,228
North	2,402	2,453	3,207
Gulf	12,215	12,602	14,021
Mississippi	2,948	2,407	3,598
New Mexico	8,376	8,790	9,271
Texas	127,184	127,663	134,719
East Texas proper	10,461	10,712	12,152
West Texas	57,329	57,248	60,017
Texas Gulf	25,144	25,742	29,390
Other Texas	34,250	33,961	33,160
Wyoming	13,123	12,960	13,441
Other Rocky Mountain	5,650	5,030	3,158
California	32,261	32,026	33,112
Foreign	†11,171	10,545	10,446
Total	273,295	271,061	286,917

*Bureau of Mines. †Includes 2,815,000 bbl. in California. ‡Included with Kansas.

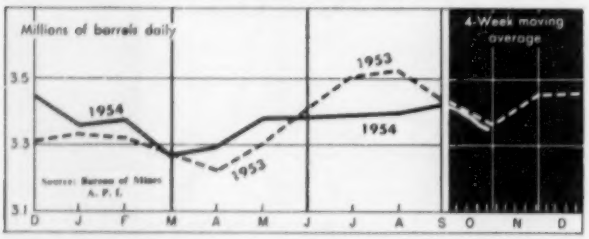
REFINERY RUNS



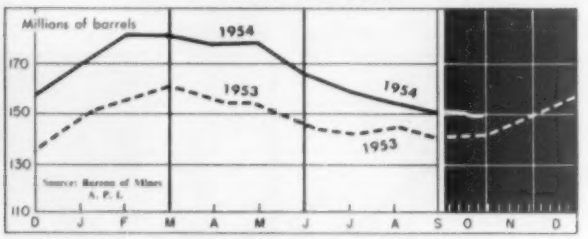
FOUR-PRODUCT STOCKS



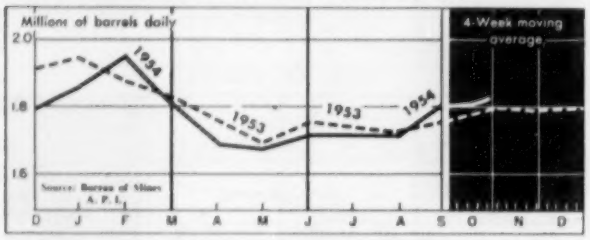
GASOLINE PRODUCTION



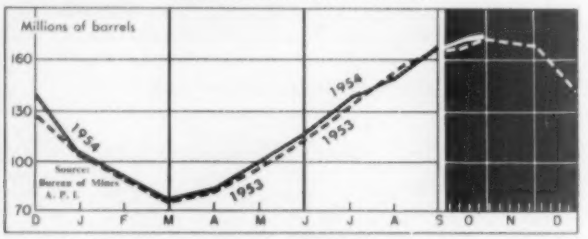
GASOLINE STOCKS



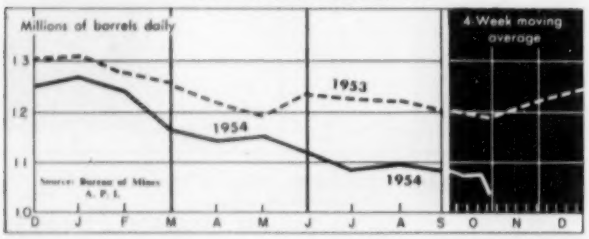
MIDDLE-DISTILLATE PRODUCTION



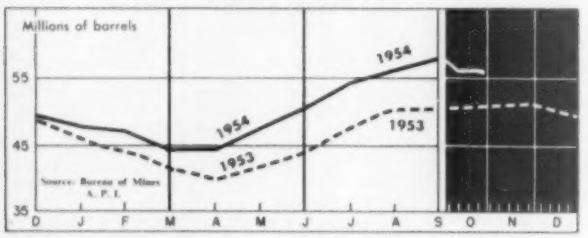
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, OCTOBER 29

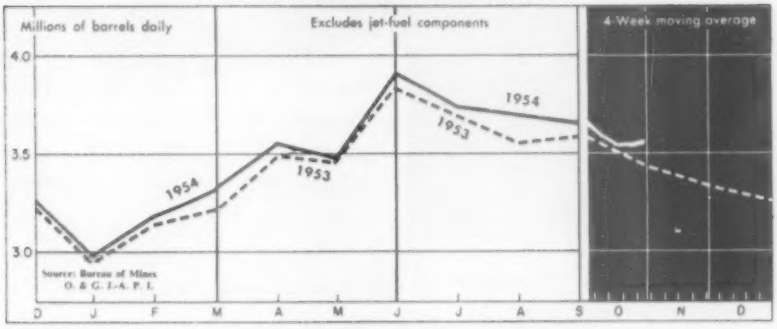
(Excludes all jet-fuel components)

(Thousands of barrels)

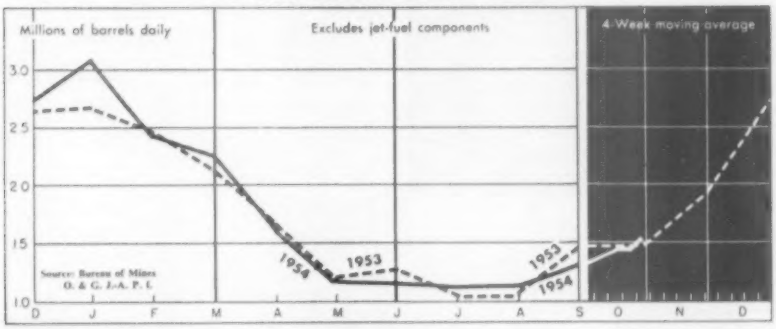
District—	Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1953— Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.
East Coast	989	444.7	36.4	254.7	194.4	34,127	15,065	52,656	10,862	1,009	428.7	33.8	256.1	209.9
Appalachian:														
District 1	97	38.6	8.3	23.9	5.0	4,524	817	2,878	494	109	46.2	6.2	17.1	11.2
District 2	97	40.7	5.7	17.6	11.3	2,248	480	879	295	85	46.2	4.3	13.0	12.5
Ind., Ill., Ky.	1,245	688.0	82.4	232.0	145.7	32,460	9,958	26,179	4,486	1,269	703.2	86.9	224.2	169.4
Okla., Kans., Mo.	579	346.0	15.6	142.8	38.6	13,405	2,408	13,206	1,326	565	330.7	10.6	138.9	49.0
Inland Texas	246	177.6	10.1	46.6	22.7	5,322	404	2,489	1,258	250	180.8	11.7	44.2	29.7
Texas Gulf Coast	1,799	858.9	118.4	406.3	229.1	20,712	4,314	16,677	6,161	1,639	822.9	131.6	383.8	235.0
La. Gulf Coast	544	258.0	34.2	172.7	33.0	9,358	3,088	4,568	1,247	548	273.8	53.5	150.2	43.7
N. La. and Ark.	91	33.4	7.9	19.1	5.6	3,824	1,130	1,467	118	90	38.2	7.2	20.1	7.2
Rocky Mountain:														
New Mexico	19	10.6		4.0	2.9	222		89	30	20	12.6	0.4	3.0	3.9
Other Rocky Mtn.	199	97.7	2.4	49.0	28.2	5,144	229	2,452	751	225	110.4	2.0	52.4	40.7
California	992	424.1	12.2	158.3	291.4	18,443	335	13,515	29,364	1,063	443.3	6.9	159.3	372.2
Oct. 29, 1954	6,897	3,418.3	333.6	1,527.0	1,007.9	149,789	38,228	137,055	56,392	6,872	3,437.0	355.1	1,462.3	1,184.4
Oct. 22, 1954	6,928	3,345.4	306.4	1,564.3	1,060.0	149,834	38,874	135,437	56,475					
Oct. 30, 1953	6,867	3,309.6	373.4	1,447.3	1,141.6	141,292	37,492	134,477	51,558					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

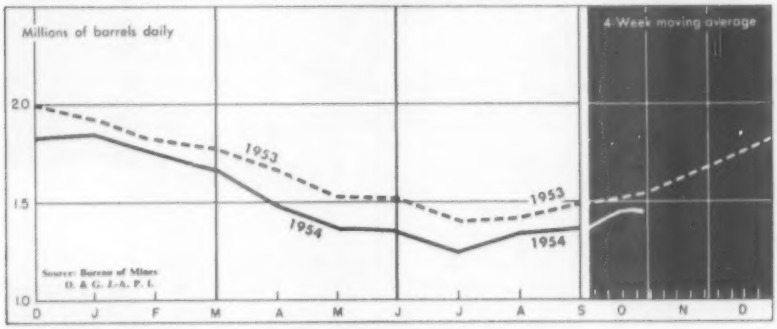
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of November 3, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11-25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.125-9.25	10.10	9-9.25
No. 2 straw fuel oil	8.375-8.5	9.35	8.5
No. 6 residual	$1.30-1.40	$2.25-2.35	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Some of the strength, given to the light fuel market by recent cold weather, is showing up as slightly higher prices in the Group 3 area. Grade 26-70 natural gasoline moved up 0.5 cent a gallon on November 1 to 5.5 cents Group 3 and 5.0 cents for North Texas.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 10-29-54	3,342	3,545
August 1954	3,391	3,649
October 1953	3,359	3,423
November 1953	3,444	3,330
Middle distillate:		
Four weeks ended 10-29-54	1,833	1,531
August 1954	1,755	1,173
October 1953	1,795	1,479
November 1953	1,785	1,926
Residual fuel:		
Four weeks ended 10-29-54	1,037	1,442
August 1954	1,069	1,272
October 1953	1,184	1,521
November 1953	1,223	1,654

CRUDE PRICES GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	....
15-15.9	1.93	....	....	....
16-16.9	1.99	....	....	....
17-17.9	2.05	....	....	....
18-18.9	2.11	....	....	....
19-19.9	2.18	....	....	....
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

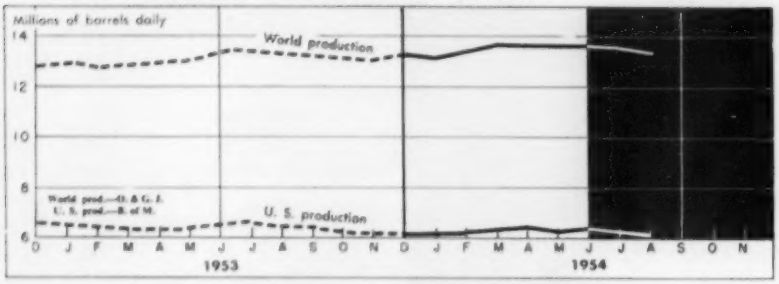
Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, September 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.23
Middle District	3.15
Southwest Pennsylvania	2.81
West Virginia	2.70
Ohio	2.74
Illinois Basin	2.90-2.95-3.02

CRUDE-OIL PRODUCTION

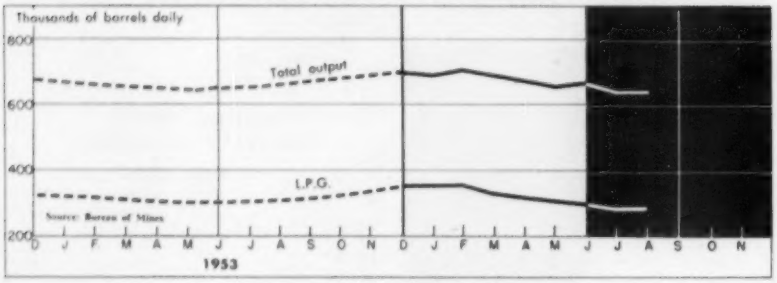


CRUDE PRODUCTION

(Thousands of barrels daily)

Month—	U. S.	World
August 1954	6,168	13,429
July 1954	6,259	13,528
June 1954	6,500	13,674
December 1953	6,238	13,241
August 1953	6,583	13,234

NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION

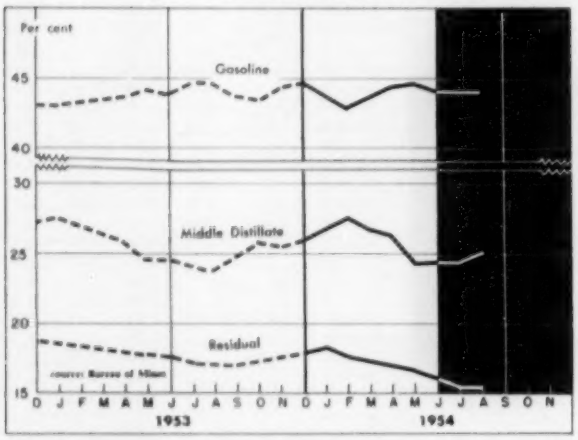


PRODUCTION AT NATURAL-GASOLINE AND CYCLING PLANTS

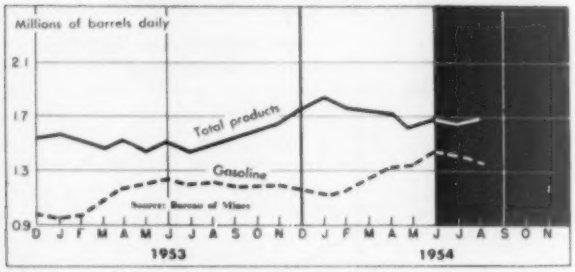
(Thousands of barrels daily)

Month—	L.P.G.	Total
August 1954	289	642
July 1954	286	642
June 1954	299	660
December 1953	348	700
August 1953	307	665

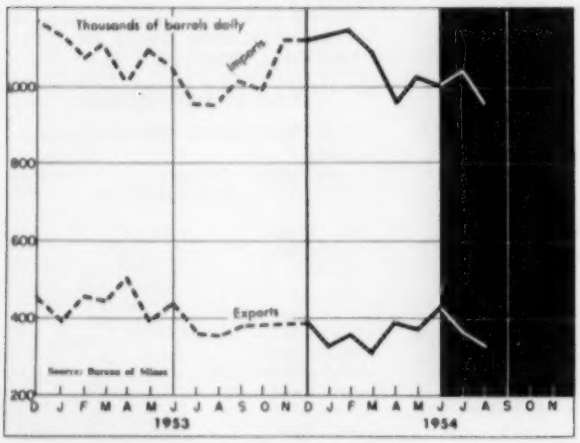
REFINERY YIELDS



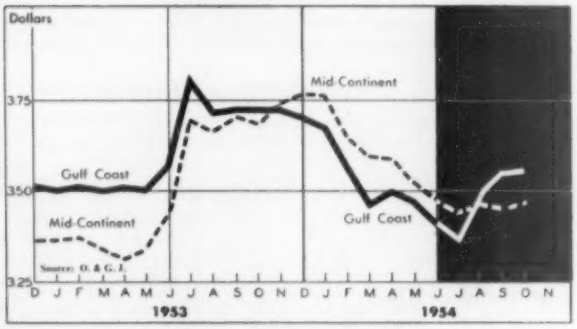
PRODUCTS DELIVERED BY PIPELINE



IMPORTS-EXPORTS



REFINERY REALIZATION



REFINERY REALIZATION

	Oct.* 1954	Sept.* 1954	Aug. 1954	Oct. 1953
Mid-Continent	$3.47	$3.44	$3.46	$3.68
Gulf Coast	3.56	3.54	3.52	3.73

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

HIGH PRESSURE EXCHANGERS: 56 new GRISCOM-RUSSELL CSS-248 twin G-FIN sections, with 1½" 4000 p.s.i. W.P. steel tubes and 3½" 1500 p.s.i. steel shells. Connections are beveled for welding. Surplus prices. Available immediately. Please contact MALONEY-CRAWFORD. Box 659, Tulsa. Phone 3-6234.

FOR SALE—Bridgeport No. 8 pumping Jack: 33 to 36 inch stroke. Beam weights, crank weights and motor base complete. Excellent condition. Price $750. Howard Gault, 915 So. Main, Ottawa, Kansas.

FOR SALE 5000' RIG: 1 250 Bethlehem complete drilling rig less derrick and drill pipe. Compound with two D-13000 Cats and 14 inch Bethlehem pump. Located: Wampler Bros., Box 1987, Longview, Texas. Phone PL 92312.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

USED EQUIPMENT

Franks East Texas Unit, mounted on K-10 International Truck. Located in Seminole area.

Franks SAL 4500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma.

O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
Box 3218, Whittier Station
Tulsa, Oklahoma

FOR SALE EQUIPMENT

FOR SALE: 564 ft. of 10" casing, in A-1 condition. Price $1500.00. Contact Duke & Wood Drilling Co., Great Bend, Kansas.

VINYL-COATED NYLON TARPAULINS. Water-proof, rot-proof, fire-proof, oil resistant, durable, seam-sealed. The Neilroy Company, exclusive distributor, 1528 E. Admiral, Tulsa, Oklahoma.

EQUIPMENT SPECIALS!

Columns: 8' x 28', 7' 6" x 56', 7' 4" x 70', 7' x 5' x 70', (2) 7' x 57' (400#), 7' x 42', 6' x 63', 5' x 62', 4' x 72', 4' x 47', (250#), 3' 6" x 63', 2' 6" x 60', 2' x 75', 2' x 45' (250#).

Heat Exchangers:
(5) 1,660 sq. ft. (Adm.), (2) 1,125 sq. ft. (850 lb.), 1000 sq. ft., 600 sq. ft. (Adm.), (5) 424 sq. ft. (Adm.), (5) 360 sq. ft., (4) 260 sq. ft.
60—Turbine driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".
2—6-stage Pacific pumps 730 GPM. 2,000 ft. hd.
2—Clark MA-4 150 BHP engines.
4 IR XVG-8 engines.
Goulds 16" 10,500 GPM. Pump. 135 ft. hd.
Oliver Filters: 8' x 10', 5' 5" x 8'.
5' x 12', 4' x 6' Drum Flakers.
Lab. Petrochem Furnace.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, Locust 1351
Sell us your surplus equipment

FOR SALE EQUIPMENT

1 CARDWELL CABLE TOOL beam type drilling-in unit complete with tool house, light plant, model 145GKU Waukesha Motor, 5" and 7" tools, and new 5,000 ft. sand and drilling lines. For inspection contact L. D. Hedrick or C. R. Moore, Great Bend, Kansas office or M. C. Hazar, McPherson office.

FOR SALE
WILSON SUPER MODEL WINCH

with Rotary drive and cathead, powered by a 140 GKU Waukesha. Unit is mounted on an LF-170 International tandem with an 8⅝" x 7" x 65' demountable, double pole mast. Complete with tools and equipment for servicing wells to 10,000 feet or drilling to 5,000 feet.

M & R SPECIALTY CO., INC.
2500 Holmes Road, Houston, Texas
Telephone LY-2666

Save $1090.00 Each

New Waukesha Engines

1—Model 5NKU Engines with gasoline-engine starting and standard oilfield accessories, less power take-offs. Price at Tulsa—$6400.00 each.

LUCEY PRODUCTS CORPORATION
624 South Cheyenne — Phone LD 204
TULSA, OKLAHOMA

33 years in the oil country, 10 years in business for ourselves with Billings, Montana Headquarters.

BIG HORN SUPPLY INC.
P. O. BOX 1493 — PHONE 8-1788
2120 3RD AVE. NORTH — BILLINGS, MONTANA

Soliciting exclusive distribution; either by purchase for resale to trade, direct or through supply stores or manufacturers warehouse agents.

FOR SALE EQUIPMENT

WELL DRILLING EQUIPMENT. New and used spudders, rotaries, core drills. Tools, pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo Colo.

FOR SALE—New drilling line—11,000 feet—6x19—type U Bethlehem improved plow steel—left lay—5,000 feet—1" dia.—6,000 feet—⅞" dia.—Also 1—used Kerotest—6x7—drilling through valve and 1—used Kerotest well head assembly. Contact M. M. Hudson, South Penn Oil Company, Bradford, Pennsylvania.

FOR SALE: Approximately 100,000'—1' 1.7# 5,000# Test Continuousweld Line Pipe, originally ordered for Kobe installations. Contact R. H. Coe, our Midland office, for direction to location our Spraberry Camp, or write Purchasing Agent, Tide Water Associated Oil Company, Box 731, Tulsa 2, Oklahoma.

1—MODEL RL 3-Drum Cardwell Powered with Buda Model 844D Diesel Engine. Rig and Engine in Perfect Condition. 1-87' 2-Pole Mast. Box H-404, The Oil and Gas Journal, Tulsa, Oklahoma.

2500 FT. FAILING rotary rig available for contract work. Production, slim hole, or cleanout. Rig and drill pipe A-1. Contact M & G Drilling Co., 1102 East St., Iola, Kansas. Phone 1979.

WILSON GIANT—$6,000: 2—Waukesha 145 GK engines in good condition; rig used for work-over. Includes Kelco spinning and Foster Breakout Catheads; pump drive and rotary drive. Call Madison 1923, Houston or Amhert 7-3311, Wichita, or write P. O. Box 2001, Wichita, Kansas.

FOR SALE—NUMBER ONE CONDITION

25,000'—Std. 4" Line Pipe, Machine Cleaned & Bevelled, 20 ft. Random lengths.
7,500'—7" O.D. Lapweld Casing, 20#, T&C
300'—X-Hvy 8⅝" O.D., ½" Wall.
This is good, used, material—priced right

STANDARD PIPE & SUPPLY COMPANY
3211 Main St. RI-1217 Dallas, Texas

FOR SALE
WILSON MOGUL 42 ROADARE

Fully equipped with 5000' Grade D & E Drill Pipe, Seven 6½" Drill Collars, 96' Heavy Duty Mast, F X Z 7¼" x 12" Gardner-Denver Pump, Two WAKDU Waukesha Motors and Miscellaneous Equipment to make complete Drilling Rig. Purchased February 1st, 1953, and Drilled 166,124' of Hole. 1000' above Drill Pipe used on one well. Equipped to Drill 5000'. For Details Contact:

NORTHERN PUMP COMPANY
Chas. J. Beu, Box 94, Telephone 7817, Great Bend, Kansas

or—**NORTHERN PUMP COMPANY**
Telephone SUNSET 8-8601, Minneapolis, Minnesota

Used Seamless STEEL TUBING

Ideal for gas, water and air lines

2" O.D.
2¼" O.D.
3¼" O.D.
3½" O.D.
4" O.D.
5⅝" O.D.
5½" O.D.

Approximately 5 miles of each diameter available in single or double random lengths with beveled ends.

Write—Wire—Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-892)
Kansas City 16, Kansas
ATwater 9305

FOR SALE EQUIPMENT

COMPLETE RIG: New U-15 Drawworks with four 250 Horse Power Cummins diesel engines through hydraulic couplings, hydromatic brakes on 127-foot 450,000-lb. Lee C. Moore mast and substructure, 8,000 Ft. 4½" Drill Pipe, 14 new 7" O.D. x 2¾" Bore Drill Collars, new Emsco D-500 7½" x 16" pump, new Cameron twin hydraulic BOP, and all accessories. Good condition. Now drilling 8,000-ft. well in Rocky Mountain area. Inventory on request. Box H-403, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE: Sullivan 200 complete with all tools ready to work. Located Tulsa, Okla. Contact R. F. Mesker, Phone 6-0057 or 5-9357 Tulsa.

KEYSTONE 5½ SPUDDER—complete with all tools: 50 Horse Le Roi engine, butane tank, light plant and tool house. Recently overhauled. Excellent condition. Price $4500. Floyd Jackson, Rantoul, Kansas, Phone 58.

U-15 WITH hydromatic brakes, powered by four 250 Horse Power Cummins diesel engines through hydraulic couplings with 127' Lee C. Moore mast, 4½" drill pipe, 6¼" drill collars, Oilwell 14P pump, mechanical Shaffer double BOP and all accessories for complete rig. First class operating condition. Rocky Mountains. Inventory on request. Box H-405, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—Near Gladewater, dismantled 1 National G-100 geared pumping power complete with 100 HP. Superior Type BT Twin Cylinder 2 Cyl. gas engine and companion material, $1500.00. Contact O. C. Brown, Gladewater office, or Patridge, Cities Service Oil Company, Bartlesville.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

FOR SALE—15 Tank Cars 10,000 gal. insulated coiled Class III. Also 8—8000 gal. Darien Corp. 60 E. 42nd, N. Y., N. Y.

FOR SALE

4800' of 4½" OD 16.60# Grade D Drill Pipe, internal flush, Range 2, with Hughes counter bore weld tool joints. This is not junk pipe and has been checked by Sonoscope Company. 3250' #2 Sonoscope Pipe and 1554' #3 Sonoscope Pipe. Priced for quick sale—#2 at $1.30 per foot and #3 at $1.00 per foot, f.o.b. location Harvey, Louisiana. Subject to inspection and prior sale. If interested write

THE NATIONAL SUPPLY COMPANY,
Tulsa, Oklahoma

Or call Mr. McFarland—Phone 2-8101

FOR SALE

16 Curtis 3 stage hi-pressure air compressors, 1000 P.S.I. 1250 C.F.H. at 550 R.P.M.

1 Ingersoll-Rand model C-50 BW type 40, four stage hi-pressure air compressor. Delivers 3000 P.S.I. at 670 R.P.M. Complete with 50 H.P. motor and starter. 5000 C.F.H. capacity.

7 Nordberg 3 stage hi-pressure compressors (4 air, 3 oxygen) upright type. Air compressors capacity 5000 to 6000 C.F.H. (260 R.P.M. at 1500 to 1600 lbs. operating pressure.) Oxygen capacity 1500 C.F.H. (140 R.P.M. at 2300 P.S.I.). All new and complete, less motor.

4 Complete new oxygen plants. 15,000 cu. ft. per day capacity. 99.5% purity. Less power unit.

DYE OXYGEN COMPANY, INC. MFGRS.
3332 W. McDowell Road
Phoenix, Arizona

FOR SALE EQUIPMENT

FOR SALE OR TRADE. Franks tubular derrick, newly shopped. Five sheave crown. 96' double. 8' base with adjustable screws on bottom. Lancaster Welding Service—Velma, Oklahoma. Phone 11k52. See Howard Lancaster.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling, $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

EQUIPMENT WANTED

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WE PAY THE MOST for Used Line pipe, used casing, abandoned leases. Gore Oil Field Supplies. Box 1063. Tulsa, Okla.

WANTED
Engines and Compressors

Used Cooper-Bessemer JS 8, LS or LSV units, 1,000 H.P. or over.

Used Cooper-Bessemer GMV 10, GMW or M-Line Compressors.

Box H-480, The Oil and Gas Journal, Tulsa, Oklahoma

HELP WANTED

PETROLEUM ENGINEER

Independent drilling and production company has opening for young graduate petroleum engineer specializing in drilling techniques and machinery. Must have field experience in Mid-Continent area, preferably drilling. Will work as assistant to Manager of Operations. Good personality essential, age limit under 35. Give complete qualifications and education in reply.

BOX H-490,

THE OIL AND GAS JOURNAL, TULSA, OKLA.

PETROLEUM ENGINEER

Major Oil Company in Venezuela has opening for graduate engineer (P.E. or Ch.E) with minimum 3 yrs. oil field exp., preferably in production engineering.

Extensive experience in chemical phases of production such as corrosion and scale control, salt water disposal by reinjection desired.

Write giving full details to:

P. O. Box #35, Bowling Green Station
New York 4, New York

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN AMERICAN OIL CO.
505 Park Avenue, New York 22, N. Y.

HELP WANTED

FOREIGN EMPLOYMENT

SOUTH AMERICA—Major Oil Company needs Petroleum, Chemical and Mechanical Engineers both experienced and inexperienced. Geologists (must be single). Tool Pushers, 5 years experience, age to 40. Company pays fee.

PERSIAN GULF—Major Oil Company needs two Refinery Maintenance Area Supervisors with at least 10 years experience. Salaries open.

INDONESIA—Major Oil Company needs two Petroleum Engineers (Reservoir Engineering). Civil Engineer and Senior Civil Engineer experienced in Oil Field construction. Two Petroleum Engineers (Chemical Engineering and Gas Section). Pipeline Engineer. M.E. or C.E. who has specialized in gas engineering. Salaries open.

NO INCOME TAX IF YOU COMPLETE TWO YEAR CONTRACT!

For Complete Details, Contact:

CHAS. J. LOVELESS PERSONNEL SERVICE
616 South Main, Tulsa 3, Okla. Ph.: 4-3193

WANTED: Distributor for Gas Lift equipment in Louisiana. Two territories now open are Shreveport area and Lafayette area. Prefer Engineering background but will give consideration to experience. Macco Oil Tool Co., Inc., P. O. Box 7288, Houston 8, Texas.

GEOLOGIST or Reservoir Engineer, experienced in subsurface geological work, estimation of reserves and deliverability studies required in connection with FPC hearings and financing. Age preference 35 to 40. Headquarters in Houston. Gulf Coast experience necessary. Good salary for quick worker with the required experience and qualifications. Box H-476, The Oil and Gas Journal, Tulsa, Oklahoma.

URGENTLY NEEDED

Refinery Maintenance Supervisor

Under 45. Graduate Engineer preferred. Salary to $10,000. Must have good refinery maintenance experience. Our fee paid. All replies confidential. Send complete resume to Chas. J. Loveless Personnel Service, 616 S. Main, Tulsa, Okla. Phone 4-3193.

DESIGN ENGINEER

Grad. Petroleum or M.E. for oil tool design. Under 30. Three years field and or design experience. Salary commensurate with background. Write giving complete resume of education, work experience and personal history. Replies will be held in confidence. Company located in Los Angeles area.

Box H-499, The Oil and Gas Journal, Tulsa, Oklahoma.

Engineers

Engineers with petroleum refinery operating experience. Several positions open to qualified engineers for field service duties in new refinery set-up and operations. Applicants must be willing to travel. All applications strictly confidential. Please send complete resume giving age, education, experience and salary desired to

Box H-477,
The Oil and Gas Journal,
Tulsa, Oklahoma

HELP WANTED

SUPERINTENDENT—35 to 55 years of age, for Asphalt Division of large independent Mid-Western refiner. Minimum of ten years asphalt experience required. Good salary and fine opportunity for advancement for right man. Box H-492, The Oil and Gas Journal, Tulsa, Oklahoma.

OPPORTUNITY FOR petroleum engineer with field and laboratory experience. Give full details of experience. Box H-490, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL OR MECHANICAL Engineer, under 35, for responsible position in Alabama Asphalt Refinery. Process or maintenance experience desired. This is good opportunity with established independent. Box H-491, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST

Opening with independent oil company for graduate subsurface geologist with good working experience in Oklahoma and Kansas. Major oil company experience preferred; must be under 35. Will do geological mapping, drafting, lease evaluations, screening deal submittals, etc. Give complete summary of experience, education and qualifications in reply. Box H-502, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—FOREIGN SERVICE

Combination Diesel and Gasoline Mechanic for supervision of transportation. Major Oil Company. Must go without family. Write Personnel Department, Box 521, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

PHYSICAL CHEMIST or Physicist, Continental Oil Company, Ponca City, Oklahoma. Immediate opening for physical chemist or physicist. Advanced degree, Ph.D. preferred. Research work in Petrophysics group, Production Research Division. New laboratory building. Excellent benefits and working conditions. Address letter giving education, experience and salary requirement to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

SITUATIONS WANTED

INSTRUMENT ENGINEER—fourteen years instrument experience; chemical, refinery & construction. Domestic or foreign. Available immediately. Box H-478, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 10 years varied production, drilling and management experience. Desires responsible position with independent or individual. Box H-466, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—10 years experience Texas, Louisiana, Oklahoma, Kansas, Nebraska, in well supervision, evaluation, appraisal, reports, record checking. Desires connection with progressive individual or small company. Will locate anywhere domestic. Box H-494, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 26, single, veteran, 2 years experience in foreign drilling. Excellent knowledge of Spanish and Arabic. Desire foreign career with organization offering opportunity for advancement. Available immediately. Box H-470, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

ACCOUNTANT—BBA degree accounting major familiar with drilling, production, joint interest, taxes, land and lease work, desires connection with independent. Capable of full charge of office. Age 45. W. R. Andrews, 128 Main Plaza, San Antonio, Texas.

GRADUATE PETROLEUM ENGINEER, 35, married, Registered Professional Engineer, desires position in Midland, Texas, with strong independent oil producer requiring initiative, resourcefulness and hard work. 5½ years varied drilling and production engineering experience in Southwest and West Texas. Box 2576, Midland, Texas.

REGISTERED PETROLEUM ENGINEER, Extensive water flood experience with major and independent companies. Diversified primary drilling, producing, reservoir evaluation, unitization, production research, lease acquisition-supervisory and management. Desire position with aggressive company. Box H-481, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING EXECUTIVE—Ch.E., more than 15 years diversified supervisory experience in Process Design, Engineering and Operation. Desires connection with company in or serving petroleum refinery or petrochemicals industry. Degrees. Box H-500, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSTRUCTION SUPERINTENDENT: twenty years experience, Industrial plants, Sewer treatment plants, pumping stations all types. M.E. Degree. Qualified to take full responsibility of projects. Cost conscious, know men and equipment, will consider Foreign work, with Major engineer-constructors. Available immediately. Box H-495, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY

P. O. Box 1628, Hobbs, New Mexico, Phone 3-3141.

146 Allen Building, Midland, Texas, Phone 2-2962.

WANTED

STRIPPER WELLS, low lifting cost and substantial reserves, any number, wanted by experienced operator, reasonable. Box H-487, The Oil and Gas Journal, Tulsa, Oklahoma.

LEADING OIL equipment manufacturer wants ideas and new or improved equipment for Refining, Pipeline, Producing or Marketing Divisions. Will acquire small or medium size companies. Our Research Department, manufacturing facilities, capital, management and nationwide sales force are well established and will buy or develop patents or work on royalty or profit sharing basis. Box H-488, The Oil and Gas Journal, Tulsa, Oklahoma.

MISTER INDUSTRIAL PRODUCTS MANUFACTURER:

Are you interested in effective Northern California Distribution? If so, we may have mutual interests.

We are a small, aggressive, efficient sales organization established ten years marketing industrial steel and rubber products. We have many friends of long standing among the Purchasing Agents, Engineers, Production Superintendents, Storekeepers, etc. of Northern California—Oil Companies, Shipyards, Chemicals Manufacturers, Airplane Manufacturers and Repair Shops, Steel Manufacturers, Food Canners, O.E.Ms., etc.

We are interested in handling a well known related specialty line. Will consider investing in inventory.

Box H-497, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

DRILLING DEALS, reasonably priced, with complete, substantiated data for development by experienced group. Box 231, Scarsdale, N. Y.

ROYALTIES

WISH TO BUY producing royalties. Box H-379, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma. Telephone REgent 6-7027.

120 ACRES WITH OIL ROYALTY—2 good houses, other good buildings, recently repaired and painted; 3 acre lake, stocked. Property partly under waterflood. Income from rent $600 year; income from oil $2200. Should increase. Price only $18,000. Clarence Coffmen, Wellsville, Kansas.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 817 Wright Bldg., Tulsa, Okla.

LEASE AND DRILLING BLOCKS

DRILLING TO commence on known and proved acreage in producing oil field. This is not a wildcat or an off-set. It's on a known structure with adequate acreage to be profitable. Interest's available at reasonable costs. One half of the cost can be charged off Taxes. Box H-501, The Oil and Gas Journal, Tulsa, Oklahoma.

1120 ACRES for Oil and Gas development, located near Oxford, Kansas, less than one mile of settled production. Box 654, Winfield, Kansas, phone 60.

HAVE SEVERAL large drilling blocks, either for sale or to be drilled. Nothing under 10,000 acres. Two of these blocks are in the hottest county in New Mexico. Tomahawk Oil & Drilling Company, 112 8th St., N.W., Albuquerque, N. M.

RECENTLY ORGANIZED group seeking drilling deals accompanied by complete geological reports. Box H-423, The Oil and Gas Journal, Tulsa, Oklahoma.

2000 ACRES OF LEASE in old Somerset Field of Atascosa County, Texas. Thirty feet of sand. Low withdrawal to date. High residual in place. Good possibilities for secondary recovery. 1500' depth. Texas Drillers, Inc., P. O. Box 948, Seguin, Texas.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

WILL BUY ⅛ interest in ⅛ drill deal on dry hole basis. Must be good. Geo., Texas, Okla., New Mexico, Wyoming. Box 22, Emmaus, Pa.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited
B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

OIL PRODUCTION

We have several producing oil properties for sale in Texas. Shallow depths. Will deal only with principals.

Box H-496, The Oil and Gas Journal, Tulsa, Oklahoma

MAP CABINETS

END MAP-FILING WORRIES FOREVER. Kraftbilt Rollfiles keep rolled maps safe from dust, dampness, pilferers. Used by all major and hundreds of smaller oil companies. Send for Catalog 352-B. Ross-Martin Co., P. O. Box 800-A, Tulsa, Okla.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

PRODUCTION WANTED

NEWLY ORGANIZED syndicate wants to buy 5,000 to 30,000 barrels oil monthly production. You will deal direct with principals. Prompt action. Evaluation report must accompany submittal. Box H-422, The Oil and Gas Journal, Tulsa, Oklahoma.

SOIL ANALYSIS

SOIL ANALYSIS—fascinating new business. Do it yourself, write for details. Surface Oil Surveys, 1414 Electric Bldg., Fort Worth, Texas.

REAL ESTATE

FOR LEASE—Complete 12 unit trailer camp, facilities to handle 19 man crew, includes power plant, water system, fuel storage. Cities Service Oil, Allen, Bartlesville, Oklahoma.

BUSINESS OPPORTUNITY

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Equipment Men

Welex Jet Promotes Jordan to Sales Engineer

John W. Jordan, Jr., has been promoted to the position of sales engineer for the Odessa district office of Welex Jet Services, it has been announced.

Jordan, a veteran of 3 years in oil-well service work, joined Welex a year ago. As sales engineer, he will perform duties in field-contact work with producers throughout the Permian basin area.

Bryant to Represent Du Mont in West Texas

Expansion of Du Mont's sales activity in the field of mobile radio to cover the western part of Texas, has been announced with the appointment of Robert Bryant of Lubbock, Tex., as a sales representative for mobile communication department of Allen B. Du Mont Laboratories, Inc.

Bryant will supervise sales and service of Du Mont's two-way mobile radio systems and base stations in the West Texas and Panhandle areas.

Bryant has been head of Lubbock Radio Co. since 1945, and has installed and maintained numerous two-way radio systems in the area he will cover for Du Mont.

Stillwagon Elected Head Of Keystone Tool Co.

C. K. Stillwagon has been elected president of Keystone Tool Co. at a recent meeting of the company's board of directors.

Other officers elected were: J. C. Stillwagon, executive vice president; W. H. Ramsey, vice president in charge of production; A. H. Snell, vice president in charge of engineering; and B. C. Pettitt, secretary-treasurer.

WILDCAT COMPLETIONS

(Continued from page 274)

Unit, C NE NE 1-42s-24e. Dry. TD 7,321 ft. Elbert.

San Pete County, Gooseberry: Carter 1 Unit, NW NE SW 16-13s-6e. Dry. TD 8,107 ft. Morrison.

Summit County, Widdop Peak: Rheem Manufacturing Co. 1 Government, NW SW SW 14-3-16e. Dry. TD 6,495 ft. Fort Union.

COLORADO

Adams County: Gem Oil Co. 2 Mitchell, SW SW SW 4-2s-59w. Dry. TD 6,289 ft.

R. W. Walker 1 Hough-Harlan, SE SE SE 14-1s-57w. Dry. TD 5,538 ft.

Jackson County, Owl Creek dome: Monolith Portland Midwest Co. 1 Government, SW NW NW 32-8n-78w. Dry. TD 10,264 ft. Triassic.

Logan County: H. C. Arnold and Calvert 1 Campbell, NW NW SE 3-7n-55w. Dry. TD 5,250 ft.

Balderson Denver Drilling Co. and Wise 1 State, SW SW SW 14-8n-54w. Dry. TD 5,195 ft.

Continental Oil Co. 1 State 22, C SW NW 22-7n-51w. Dry. TD 4,812 ft.

Moffat County, Beaver Creek: Stanolind Oil & Gas Co. 1 Radcliff, W½ NE NE 15-4n-90w. Dry. TD 4,730 ft. Entrada.

Morgan County, Park: British-American Oil Producing Co. 1 Hegarty, C NW SE 26-1n-59w. IPF 157 BOPD, "J" sand discovery, new field. TD 6,302 ft.

G. L. Reasor 1 Patterson, C SE NE 4-5n-58w. Dry. TD 7,357 ft.

Rio Blanco County, Little Poose Creek: English Oil Co. 1 Johnson-Government, NE NE NW 28-3n-88w. Dry. TD 1,555 ft. Shinarump. Temp. suspended.

Axial Basin: General Petroleum Corp. 1-63 Nine Mile, NE SW NE 1-2n-93w. Dry. TD 9,457 ft. Weber.

Washington County: Rocky Mountain Standard and Barnes & Brown and Eckhardt 1 Roderick, SE SE SW 34-1s-53w. Dry. TD 4,802 ft.

Weld County: S. D. Johnson and U. S. Smelting 1-10 State, C SE SE 10-4n-62w. Dry. TD 6,735 ft.

SASKATCHEWAN

Delhi-Husky-Phillips-Richfield 1 Bone Creek, LSD 6, 34-10-19w3. Shaunavon oil well. TD 4,458 ft.

Socony-Sohio 21-4 Harptree, LSD 4, 21-4-26w2. Dry. TD 6,585 ft.

Tide Water 3 Kyle Crown, LSD 12, 32-20-14w3. Dry. TD 2,843 ft.
Shell A-1-18 Benson, LSD 1, 18-6-8w2. Dry. TD 5,725 ft.
Shell A-10-20 Holloway, LSD 10, 20-6-11w2. Charles oil well. TD 4,908 ft.
Amurex-Canadian Southern 1-13 Coulter, LSD 13, 4-14-23w3. Dry. TD 3,601 ft.
Socony-Sohio 19-11 Ridpath, LSD 11, 19-29-15w3. Dry. TD 2,910 ft.
Canada Southern-Shell 16-36 Boundary, LSD 16, 36-1-23w3. Dry. TD 5,039 ft.

MANITOBA

British American-Union 15-1 Kool, LSD 15, 1-9-28w1. Miss. oil well. TD 2,552 ft.
Sapphire 16-20 West Blossom, LSD 16, 20-12-25w1. Dry. TD 2,050 ft.

ALBERTA

Southern Production-Atlantic "XA" 22-1 Bonanza, LSD 7, 15-81-12w6. Dry. TD 2,500 ft.
Rio Prado 5-30 Chauvin, LSD 5, 30-43-1w4. Dry. TD 2,298 ft.
Cal-Standard 5 Grassy Island Lake, LSD 10, 10-31-8w4. Dry. TD 3,465 ft.
Richfield-Hudson's Bay-Phillips-Husky 4-10 Cameron, LSD 4, 10-42-12w4. Basal quartz gas well. TD 3,140 ft.
New British-U. S. Smelting 11-20 Pakowki, LSD 11, 20-4-8w4. Bow Island gas well. TD 2,300 ft.
Evans-Union 6-13 Peace River, LSD 6, 13-88-22w5. Dry. TD 6,187 ft.
Imperial 15-17 Smith, LSD 15, 17-71-25w4. Dry. TD 4,083 ft.
Homestead-Admiral-Territories 1 Stanmore, LSD 10, 4-31-10w4. Dry. TD 3,527 ft.

BRITISH COLUMBIA

J. B. White 1 Lloyd Blueberry, Unsurveyed. Dry. 8D 4,430 ft.
Texaco-NFA 3 Nig Creek, Unsurveyed. Dry. TD 4,960 ft.

ADVERTISERS IN THIS ISSUE

Aeronautical Service, Inc. 252
Aitkin Co., M. N. 240
Aldrich Pump Co., The 222
Alexander Shipyard Inc. 253
Allis Co., The Louis 13
Alten Foundry & Machine Works, Inc. 261
American Chemical Paint Company 96
American Iron & Machine Works Co. 253, 263
American Locomotive Company 62, 63
American Manufacturing Co. of Texas 5
American Steel & Wire Division 32, 33
Ampco Metal, Inc. 249
Anthony Company 255
Appleton Electric Company 44, 45
Axelson Manufacturing Company 220, 221
B and W Inc. 269
Bansh-Ross Tool Company 197
Barton Instrument Corporation 104
Bauer & Black Division of The Kendall Company 87
Beaird Company, Inc., The J. B. 19, 20
Bendix Aviation Corporation 88
Bethlehem Steel Co. 178
Black, Sivalls & Bryson, Inc. 43
Bos-co Equip't Eng'r'g & Mfg. 198
Bovaird Supply Co., The 77
Broderick & Bascom Rope Co. 189
Brodie Co., Inc., Ralph N. 11
Brown Fintube Co., The 231
Bullard Company, E. D. 202
Burgess-Manning Company 95
Byron Jackson Co. 41
Carrier Corporation 215
Carter Company, Inc., S. C. 170
Central Standard Life Insurance Company 272
Charles Machine Works, The 196
Clark Bros. Co. One of the Dresser Industries 24, 25
Classified Advertising 287, 288, 289, 290
Climax Engine and Pump Mfg. Co. 271
Continental Can Company 207
Continental Motors Corp. 28
Continental Supply Co., The 99, 100, 189, 190
Cooper-Bessemer Corp., The 181
Cooper, Inc., Fred E. 204, 216, 224, 225
Coppus Engineering Corp. 3
Crane Co. 7
Crose Manufacturing Co., Inc., M. J. 206
Crowell Consulting Co. 205
Cutler-Hammer, Inc. 21
D+B Division Emsco Manufacturing Company 100
Davison Chemical Company Division of W. R. Grace & Co. 47
Dean Brothers Pumps, Inc. 253
De Laval Steam Turbine Co. 42
Delta Engineering Sales Co. 200
Deublin Company 223
Distinguished Hotels 59
Dollinger Corporation 46
Dowell Incorporated 258, 259
Dresser Industries, Inc. 208, 209
Dresser Manufacturing Division 234
Drilling & Service, Inc. 273
du Pont 57, 58
Durabla Manufacturing Company 230
Edward Valves, Inc. 195
Emsco Manufacturing Company D+B Division 100
Fairbanks, Morse & Co. 267
Farrel-Birmingham Co., Inc. 36
Fleet-Line Co. 200
Flint Steel Corporation 61
Floridin Company 217
Fort Worth National Bank, The 202
Four Wheel Drive Auto Co., The 26
Fuller Company 76
General Electric Company 67
General Electric Co., Electronic Dept. 53
Gilbert & Barker Mfg. Co. 30
Globe Oil Tools Company 105
Goodall Rubber Company 210
Gourock Ropework Co., Ltd., The 255
Grancell, I. H. 195
Graver Tank & Mfg. Co., Inc. 54, 55
Grove Valve and Regulator Company 85
Guiberson Corporation 241
Halliburton Oil Well Cementing Co. Inside Front Cover, 8
Hammond Iron Works 18
Harnischfeger Corp. 6
Harrisburg Steel Corporation 231
Hartwell & Son, Inc., H. M. 268
Hazard Wire Rope Division of American Chain & Cable Co., Inc. Inside Back Cover
Hercules Tool Company 248
Hickman Corp., The 196
Houdry Process Corporation 199
Houston Contracting Company 205
Hughes Tool Co. Back Cover
Industrial Crane & Hoist Corporation 270
Inferno Co., The 196, 269
Infilco Incorporated 233
Ingersoll-Rand 48, 49
Intercontinental Hotels Corporation 50
Iverson Supply Company 64
Jet-Lube Inc. 236
Johns-Manville Corporation 201
Johnston & Jennings Company, The, Division of Pettibone Mulliken Corporation 219
Johnston Testers, Inc. 23
Jones & Laughlin Steel Corporation Supply Division 51
Jones Company, The S. M. 60
Kaiser Engineers Division of Henry J. Kaiser Company 84
Kerrigan Iron Works, Inc. 238
Kinzbach Tool Co., Inc. 263
Klinger Limited, Richard 193
Koehring Company 9
Ladish Co. 91
Lane-Wells Company 106
Larkin Packer Company, Inc. 232
Layne & Bowler, Inc. 93
LeGrand Sutcliff & Gell Limited 56
Levingston Shipbuilding Co. 260
Limitorque Corporation 35
Lone Star Cement Corporation 110
Lufkin Foundry & Machine Co. 16
Manhattan Rubber Division, Raybestos-Manhattan, Inc. 52
Mannesmann-Export 97
Manton-Gaulin Manufacturing Company, Inc. 92
Marsh Instrument Co. 65
Martin-Decker Corp. 269
McKee & Co., Arthur G. 81
Mid-Continent Supply Company 98
Miller Sand Pump Co. 252
Minneapolis-Honeywell Regulator Co., Industrial Division 70, 71
Mission Mfg. Company Front Cover
Moore Corporation, Lee C. 266
Morgan Stanley & Co. 245
Muldrow Aerial Surveys Corp. 267
Murphy Diesel Company 73
Mutual Chemical Company of America 214
National Airoil Burner Co., The 227
National Bank of Tulsa 78
National Supply Co., The 37, 38, 39, 40
National Tank Company 292
Newport News Shipbuilding and Dry Dock Company 27
New York Belting & Packing Co. 190
Nordberg Mfg. Co. 228, 229
Norris Manufacturer, Inc., W. C. 159
Oil Center Tool Co. 72
Oil Well Supply Division 4
Okadee Company 264
Onan & Sons, Inc., D. W. 261
OPW Corporation 2
Orbit Valve Company 127, 279
Pacific Car and Foundry Company 256
Pacific Coast Borax Co. 250
Partlow Corp., The 268
Pedrick Tool & Machine Co. 272
Peerless Mfg. Co. 89
Peerless Supply Co. Inc. 200
Penn Metal Company, Inc. 82
Petreco A Division of Petrolite Corporation 275, 276
Petroleos Mexicanos 237
Petroleum Distributing Co. 264
Petroleum Electric Power Assn. 80
Philadelphia Gear Works, Inc. 35
Phoenix Manufacturing Company 263
Powell Valves 68
Ramsey Company, Inc., Stan 278
Ratigan, Inc., J. P. 252
Raybestos-Manhattan, Inc., Manhattan Rubber Division 52
Republic Steel Corporation 79
Reynolds Metals Company 39
Ridge Tool Company, The 102
Robbins & Myers, Inc. 218
Rockford Clutch Division of Borg-Warner Company 34
Ross-Martin Co. 196
Royal Bank of Canada, The 184
Safe Lighting Inc. 198
Seismograph Service Corp. 247
Shaffer Tool Works 174
Shand & Jurs Co. 86
Shell Oil Company 83
Sherman Products, Inc. 239
Smith Oil Tool Co., H. C. 194
Solar Aircraft Company 17
Southern Mill & Mfg. Co. 240
Southwestern Engineering Company 103
Spang-Chalfant Division of The National Supply Co. 38, 39, 40
Steel Forgings, Inc. 200
Succop Refinery Engineering Company 180
Technical Oil Tool Corporation 94
Templeton, Kenly & Co. 196
Thompson Tool Co. 185
Toledo Pipe Threading Machine Co. 236
Tretolite Company A Division of Petrolite Corporation 182
Tuloma Builders, Inc. 252
Turner Uni-Drive Company 272
Unit Rig & Equipment Co. 166
United States Rubber Company 66
United States Steel Corporation—
American Steel & Wire Division 32, 33
Oil Well Supply Division 4
USS Stainless Steel Division 74, 75
United Supply & Manufacturing Co. 213
Universal Atlas Cement Co. 242
Universal Oil Products Co. 14, 15
Valley Electric Corp. 235
Voss Co., Inc., J. H. H. 219
Warren Petroleum Corporation 108
Wedgepiug Valve Company, Inc. 251
Welex Jet Services Inc. 101
Well Equipment Mfg. Corp. 274
Western Company 31
Westinghouse Electric Corp. 22
Williams Company, W. Horace 12
Williams Machine Company, Inc. 254
Willson Products, Inc. 235
Willys Motors, Inc., Industrial Engine Department 10
Wilson Manufacturing Co., Inc. 69
Worthington Corporation 90
Youngstown Sheet and Tube Company 157
Zink Company, John 186

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